FOUNDRY

JANUARY
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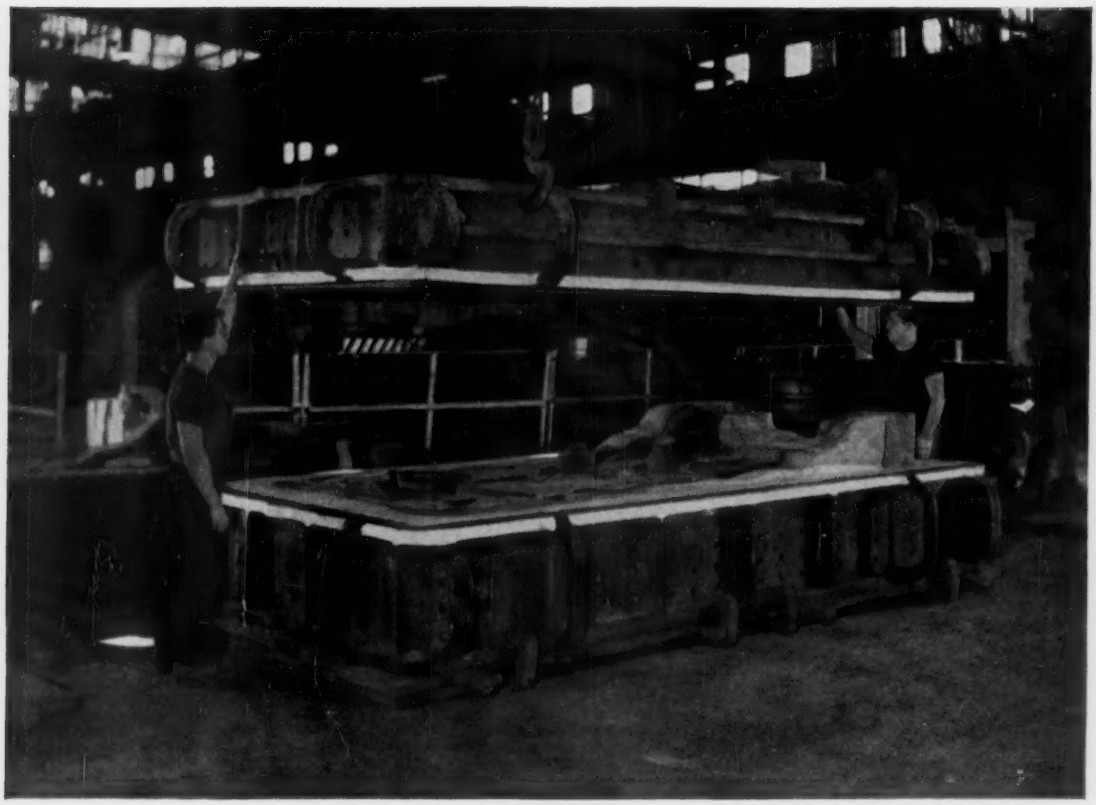
A PENTON PUBLICATION

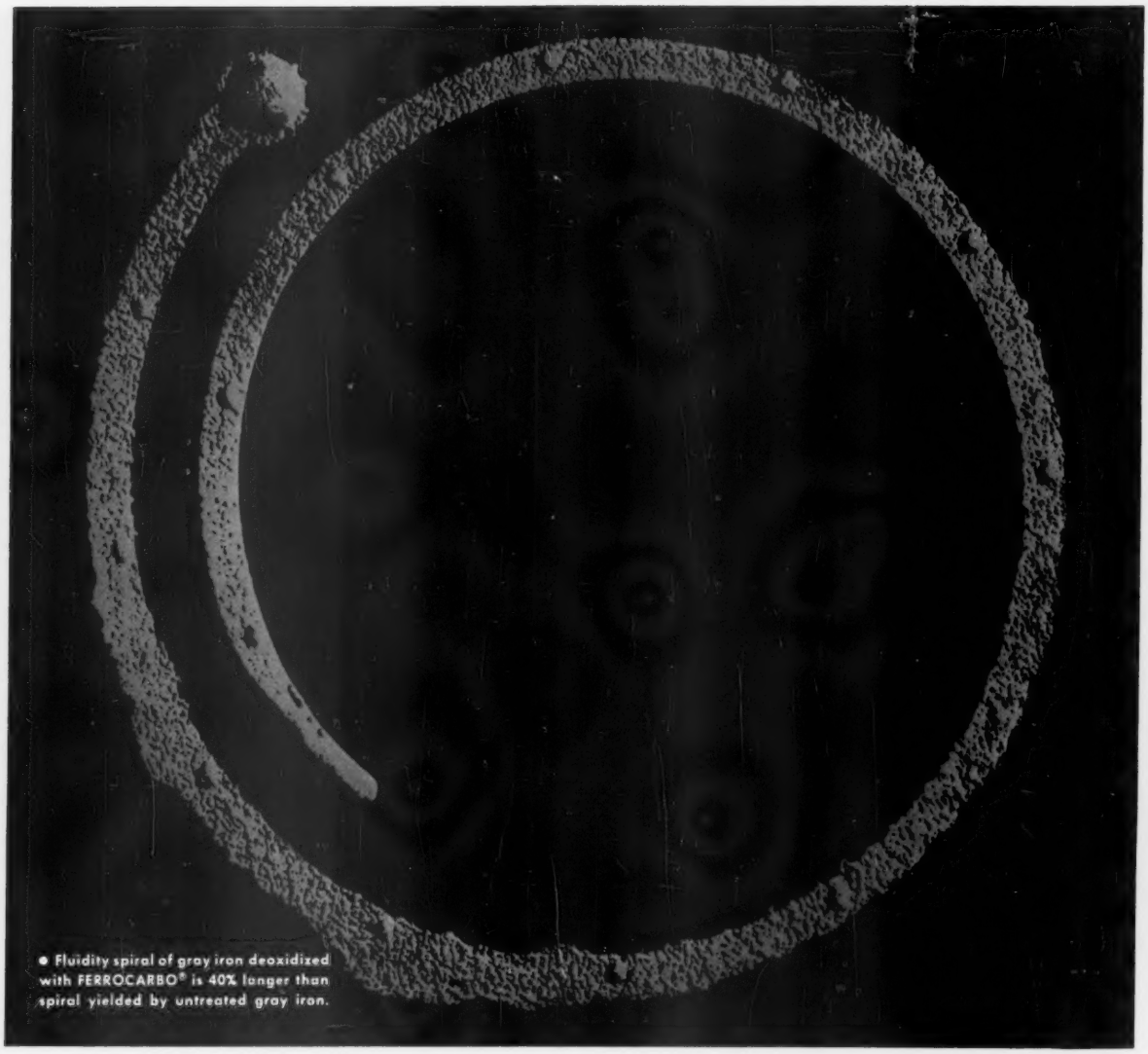


✔ **Casting Steel in Green Sand Molds**
A review of modern practice in the making of large castings—p. 86

✔ **Modern Equipment for Heat Treating**
It can help to lower costs in the malleable iron foundry—p. 104

✔ **Making Sound Investment Castings**
How to correct those defects found on visual inspection—p. 110

✔ **Molding Practice in Casting Brass**
Methods, equipment and accessories used in the brass foundry—p. 100



● Fluidity spiral of gray iron deoxidized with FERROCARBO® is 40% longer than spiral yielded by untreated gray iron.

BETTER CASTINGS start with more fluid iron...

And iron deoxidized with FERROCARBO® patented Briquettes *is more fluid* at casting temperatures than untreated iron. You can prove this in a ten day test in your cupola. Longer runs are evident from the first day you add FERROCARBO to the charge. After eight to ten days, when the sprues and returns are saturated, the spiral fluidity molds will show ***considerably longer*** runs.

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84-43R

B.F.Goodrich

Foundry reports B. F. Goodrich belt cuts clean-up time 90%

IT used to take a man an hour or two a day to clean up the mess around that conveyor belt. Sizzling hot sand, from casting molds, is dumped on the belt and carried to storage.

A woven asbestos belt was used, but it had to have "first aid" every three weeks—a sticky dressing to protect it from the 300 degree heat. Then the steaming sand would cling to the belt cover. Some would build up on the return idlers, a great deal dropped on the floor. Clean-up time was costing the company $900 a year.

Then a B. F. Goodrich man told them his company had developed a special heat-resisting rubber for belts carrying such things as hot sand, lime, nitrates. Instead of ordinary fabric, B. F. Goodrich uses *glass* fabric to make a belt that can stand extreme heat.

The foundry installed this B. F. Goodrich belt. It runs 8 hours a day, 5 days a week, handles 75 tons an hour. Since it needs no liquid dressing, there's no sticking, no spillage. Clean-up time has been cut to once every 3 weeks.

Making a belt that stands terrific heat is typical of B. F. Goodrich product improvement. Other BFG improvements have resulted in Grommet V belts that last 20 to 50% longer, air hose that lasts for years in heat, oil, hard knocks—and hundreds of other products that last longer, serve better. You can get these cost-saving benefits through B. F. Goodrich distributors. Or write *B. F. Goodrich Industrial Products Company, Dept. M-834, Akron 18, Ohio.*

B.F.Goodrich

INDUSTRIAL PRODUCTS

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from the **clay** *itself . . .*

. . . not from a test tube

that's where Federal GREEN BOND *gets its* low viscosity!

You'll get no "test tube" bentonite in GREEN BOND bags, because Federal doesn't resort to "alchemy" in producing its low viscosity bentonite. It doesn't have to — for low viscosity is a *natural* characteristic of the bentonite clay from which Federal GREEN BOND is processed. It's in the clay to start with — doesn't have to be concocted by adding certain chemicals.

If you'd like to fully appropriate the advantages of low viscosity, you'd best avoid "test tube" bentonites! For the very chemicals that might be added to bentonite, to lower its natural viscosity, *also lower the durability* of bentonite, causing it to burn out faster and quickly lose its ability to develop green and dry bond strength.

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FOUNDRY
A PENTON PUBLICATION

January 1957
Volume 85—Number 1

Editorial 85

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(For addresses of branch offices, see page 267)

THE COVER: View of a mold-closing operation is by courtesy of Continental Foundry & Machine Div. of Blaw-Knox Co.

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The clue to a quick solution is the familiar ARCHER. Whether you are producing conventional cores, hollow cores, or shell molds; whether you cure cores at room temperature, in ovens, or with CO_2; ADM, once famous in foundries only for its LINOIL, now offers a binder for *every process, every type core, every kind of sand.*

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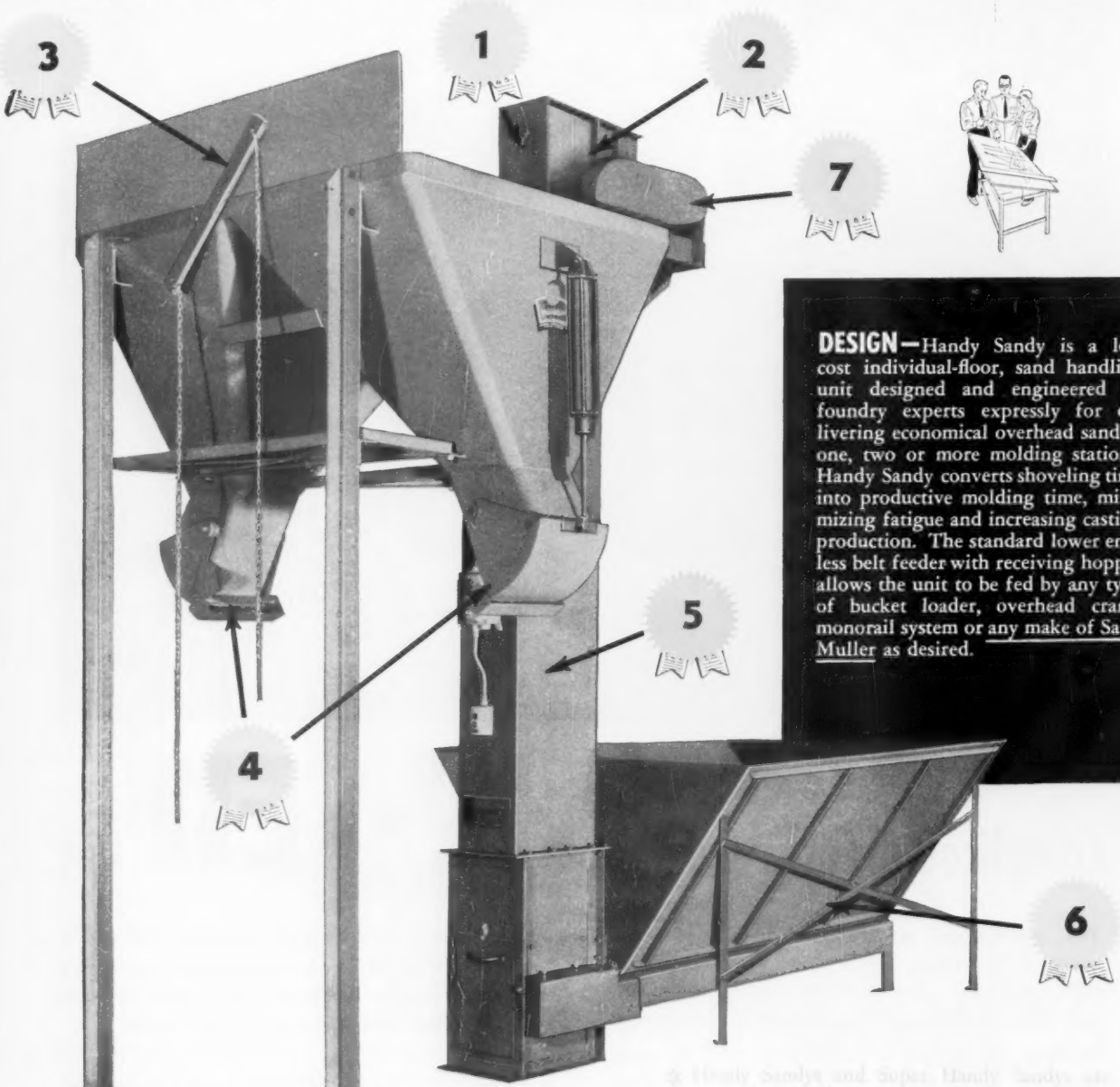
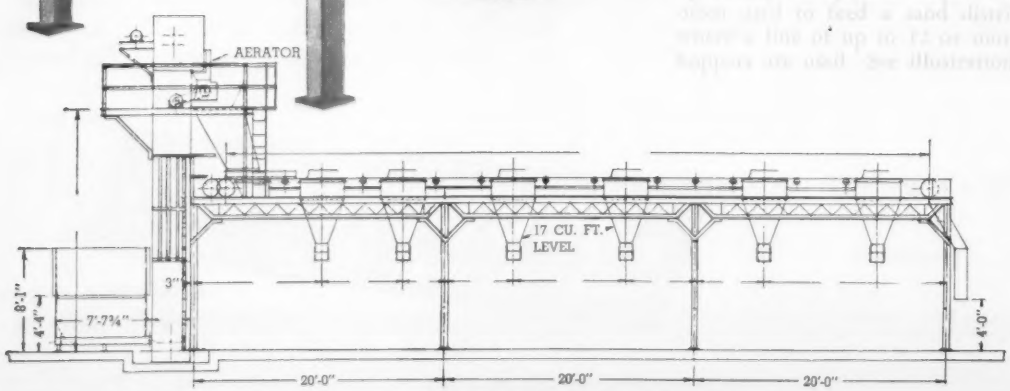
are proving their value in foundries everywhere



DESIGN—Handy Sandy is a low cost individual-floor, sand handling unit designed and engineered by foundry experts expressly for delivering economical overhead sand to one, two or more molding stations. Handy Sandy converts shoveling time into productive molding time, minimizing fatigue and increasing casting production. The standard lower endless belt feeder with receiving hopper allows the unit to be fed by any type of bucket loader, overhead crane, monorail system or any make of Sand Muller as desired.



Circle 559 on Inquiry Card—Page 201

1

SEPARATE BUILT-IN AERATOR

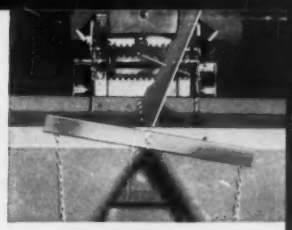
With separate drive at the head of the elevator actually cuts, blends and spreads sand as it is discharged into the overhead hoppers. Handy Sandy does not depend on a high-speed elevator discharge to "throw" sand into the hopper. Separate aeration is also maintained when Handy Sandy is used with a distributing belt to feed a series of hoppers in line.*

2

AUTOMATIC SAND SHUTOFF

This automatic shutoff prevents overloading in overhead hoppers. Sand elevator and feeder stop automatically when sand reaches a predetermined level in the overhead hopper. The molder simply starts the machine which operates until hoppers are full, then automatically shuts off. Automatic starting control available as optional equipment.

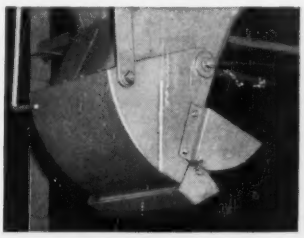
3



SAND VOLUME EQUALIZER

On the twin hopper Handy Sandys the Newaygo engineered sand volume equalizer proportions the amount of sand going into each hopper. Sand is easily controlled by the operator to compensate for unequal hopper requirements.

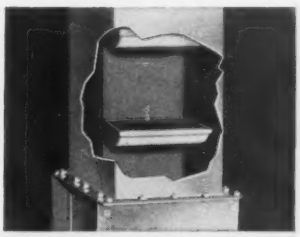
4



DRIBBLE GATES

Another Newaygo engineered development. The overhead dribble gate seals tightly when closed and prevents sand particles from dropping into the prepared mold.

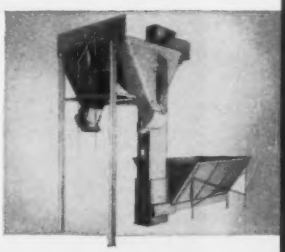
5



BUCKET ELEVATORS

Feature full width, heavy duty belts supporting a series of cast buckets. Also available with heavy duty chain belt. Elevator runs at moderate speed. This means less power requirement and keeps maintenance at a minimum. Elevator head and boot are designed with quick opening access doors to all moving parts.

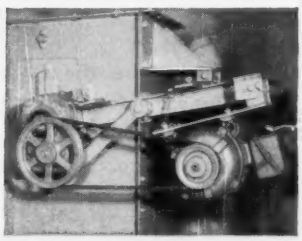
6



LOWER SAND STORAGE HOPPER WITH ENDLESS BELT FEEDER TO ELEVATOR BOOT

Standard Handy Sandys have a capacity of 8 to 10 tons of sand per hour. The lower feed hopper can be supplied with storage capacity up to 12 tons of sand. Super Handy Sandys have sand capacities up to 40 tons per hour.

7



AUTOMATIC ELEVATOR TAKEUPS

Air operated and 100% automatic. Assures positive alignment of head shaft at all times and controlled tension on the elevator belt or chain, speed reducer and aerator V-belt drives, without manual attention.

8

FLEXIBILITY

The unlimited variations in floor arrangements, hopper sizes and shapes have resulted in the successful use of Handy Sandys on molding floors in large and small foundries. No pits or foundations are necessary. Other applications include feeding core and mold blowers, shell molding machines and sand mullers.

9

LESS HEADROOM

The overall height of the Standard Handy Sandy is 13′ 1⅛″. This is several feet less than other makes, and is an important consideration in foundries with limited headroom.

10

EIGHT STANDARD MODELS TO CHOOSE FROM

Model No.	Type of Hopper Station	Type of Outlet	No. of Outlets
HS-4-G	Single	Single Leaf	1
HS-4-D	Single	Hand Pull Out	1
HS-4-GT	Double	Single Leaf	2
HS-4-DT	Double	Hand Pull Out	2
HS-7-G	Single	Single Leaf	1
HS-7-D	Single	Hand Pull Out	1
HS-7-GT	Double	Single Leaf	2
HS-7-DT	Double	Hand Pull Out	2

Special Hoppers and Gates available to suit all types of molding machines.

Send for Bulletin No. 56

32 pages of information and specifications on the complete line of Newaygo Sand Handling, Mold Handling and Mold Making Equipment

NEWAYGO engineering company
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Imperial INNERLOCKED* Belts have won top position handling hot foundry sand in The McNally Pittsburgh Foundries, Inc., plant, built in 1945.

On the conveyor shown above, an Imperial Super-Insulated Sahara Belt (80′ x 24″ x 6-ply) carries searing, sizzling shakeout sand so hot it requires the heat-resisting capacity of Imperial's 600° belt.

Best for foundry service. Many foundries throughout this country and Canada use only Imperial belting on their "hot" conveyors and elevators. Experience has shown this heavy-duty canvas belting with its exclusive INNERLOCKED* stitching and superior heat-resistant impregnating compounds lasts much longer than lesser belts.

Asbestos layers withstand temperatures to 600°F. For protection from severe impact and abrasion, metallic reinforcement is available at no extra cost.

Job-designed belting. Whatever your needs, there is an Imperial Belt job-designed to give you lowest ultimate belt cost and highest day-to-day operating satisfaction. Write for Data Sheet 54-2 which describes Imperial Belts for foundry service.

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You expect MORE from Imperial . . . and you get MORE!

Circle 560 on Inquiry Card—Page 203

With the Editors

ANOTHER VOLUME: Another year has gone by, another year of foundry progress, much of which has been reported in the past 12 issues of FOUNDRY. Now we start on another year of telling the industry of the developments in the field of castings. To accomplish this reportorial job, the editors will be out in the field calling on foundries, attending meetings, and talking with foundrymen about what is new in castings production. They also will interview equipment and supply manufacturers, gathering information on the tools that will help produce better castings.

We will be happy to see you—and we hope this will be mutual.

In the meantime—Happy New Year!

—o—

Some Haul: Leaders of the industry have talked loud and long about the shortages of scrap developing from the unrealistic exportation of the best grades of that mineral resource. But they had no idea how bad the situation really has become. Chicago now has the answer.

Recently thieves in that city took 56 park district lamp posts weighing 18 tons from a fenced-in area. The haul consisted of 40 cast iron posts, 14 ft tall and weighing 750 lb each, 15 aluminum posts 25 ft tall, an antique lamp post from the Columbian exposition of 1893, and three masts from the Columbian exposition.

If the scrap situation gets any worse, better watch some of the Civil War cannon scattered around the country.

—o—

Vermont Life: Norman G. Knapp, manager, Gray Foundry Inc., Poultney, Vt., has sent us a copy of the Winter issue of *Vermont Life,* the official publication of the state of Vermont. It is a beautiful job with much interesting material and many excellent illustrations, some in color.

The lead story, entitled "Furnaces, Forges and Foundries," tells of the early iron industry of the state when many stacks were built to convert Vermont bog ore and hematite into iron, and how foundries turned this iron into cast products. Coming down to the present, the Gray Foundry is described and illustrated.

Another article in this issue, entitled "Keep The Home Fires Burning," provides a number of sketches of early kitchen, home and office stoves, all of them excellent examples of the casting art.

—o—

Bill the Bard: Bill Walkins, author of that famous book *Rammed Up and Poured* and editor of *The Esco Ladle,* published by the Electric Steel Foundry Co., Portland, Ore., has a bit of poetry in each issue of the *Ladle* under the heading "The Foundry Bard." I particularly liked the one in a recent issue on Values:

How oft, it seems, this puzzled bard
Has racked his weary brain so hard
In vain, to solve in prose and verse
The mystery of the universe.

How futile, then, it sometimes seems
To waste our time with thoughts and dreams
We might be otherwise employed
So many things to be enjoyed.

There's pleasure, if it can be told
In ramming up a perfect mold
The great elation one can feel
Who's made a masterpiece in steel!

There's really fun, when there's the need
Of turning out a job with speed
To be efficient, skillful, fast.
The job comes first, the pay check last!

A joy is truly to be found
In turning over fertile ground.
In spring, to those it fairly sings
Who take delight in growing things.

Contentment's in secluded nooks
Adventure in the world of books.
Happy is the humdrum life
The job, the home, the kids, the wife.

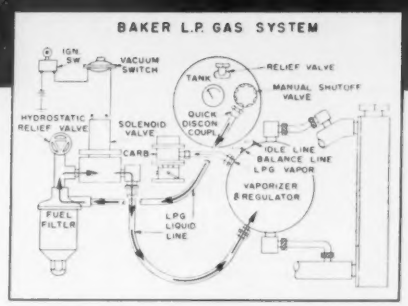
Who revels in a joy ethereal
Accumulating things material?
How oft we seek elusive pleasures
And overlook life's greatest treasures.

By Bill Walkins

—o—

We Will Have Snow: The 1957 issue of *The Old Farmer's Almanac,* published by Yankee Inc., Dublin, N. H., tells us that our winter will be "Even and fine—many storms, but good weather in between, averages colder than last year, especially in February, on the whole more snow." Abe Weathwise, who handles this prediction, does a bit of justified bragging in this issue. Last year he stated that the winter would be "As severe as any in the 20th century!" Abe says, "If immodesty on our part in pointing with pride to the success of last year's prediction will be forgiven, which we doubt, we would like to point out that with the exception of February, during which Europe took onto itself the bad weather Abe had expected here, the past winter will stand in the records of the 20th century as 'severe.' Several records were established: Long cold spell end of December—long northeastern storm Jan. 8-13—great icing Mt. Washington, and most snow of any March."

BAKER *offers LP gas fork trucks in 2000 to 7000 lb. capacities*



Arrows trace the flow of LP gas from the tank through the filter to the vaporizer and regulator before it enters the engine. The hydrostatic relief valve opens the system before dangerous pressure is reached in event of high ambient temperature changes. Automatic fuel shut-off is provided by solenoid valve and vacuum switches when engine stops. For maximum efficiency, the vaporizer preheats the LP gas before it passes to the regulator and the regulator reduces the pressure before the gas enters the carburetor.

The complete Baker line includes the BAKER LP gas fork trucks for those desiring the cost savings, cleaner operation, and other advantages provided by liquefied petroleum gas.

The Baker LP gas truck is powered by an engine specially designed for LP gas, not just a conversion unit. The special LP engine is provided with high compression head for maximum efficiency. Among the features are a special cold manifold and hot thermostat for cooler operation. Stellite-faced exhaust valves and solid Stellite inserts assure greater dependability and longer life. Complete vaporization and more efficient combustion mean lower oil consumption, less down time and reduced maintenance costs due to minimum cylinder wear. Fuel tank conveniently located behind the driver can be removed and full tank installed in less than a minute.

Write for information.

Baker® industrial trucks

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BRASS • ALUMINUM • MAGNESIUM
AND ALL OTHER
NON-FERROUS ALLOYS

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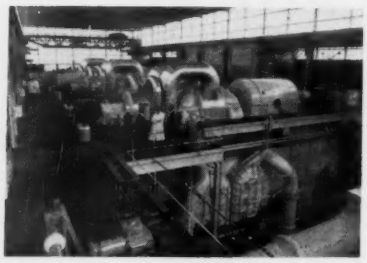
300-320 MOORE ST. HARRISON, OHIO

So perhaps you may place faith in the predictions for this winter.

—o—

Visits Nuclear Plant: Shortly before the Queen opened the first atomic energy power station at Calder Hall, Cumberland, England, Vincent Delport, European editor of FOUNDRY, was privileged to visit that interesting installation. While the steam generating plant is entirely dif-



ferent, with the reactor replacing the usual coal fired boilers, the turbine-alternators (shown above) follow conventional lines. Many castings were used in constructing this new type of generating plant.

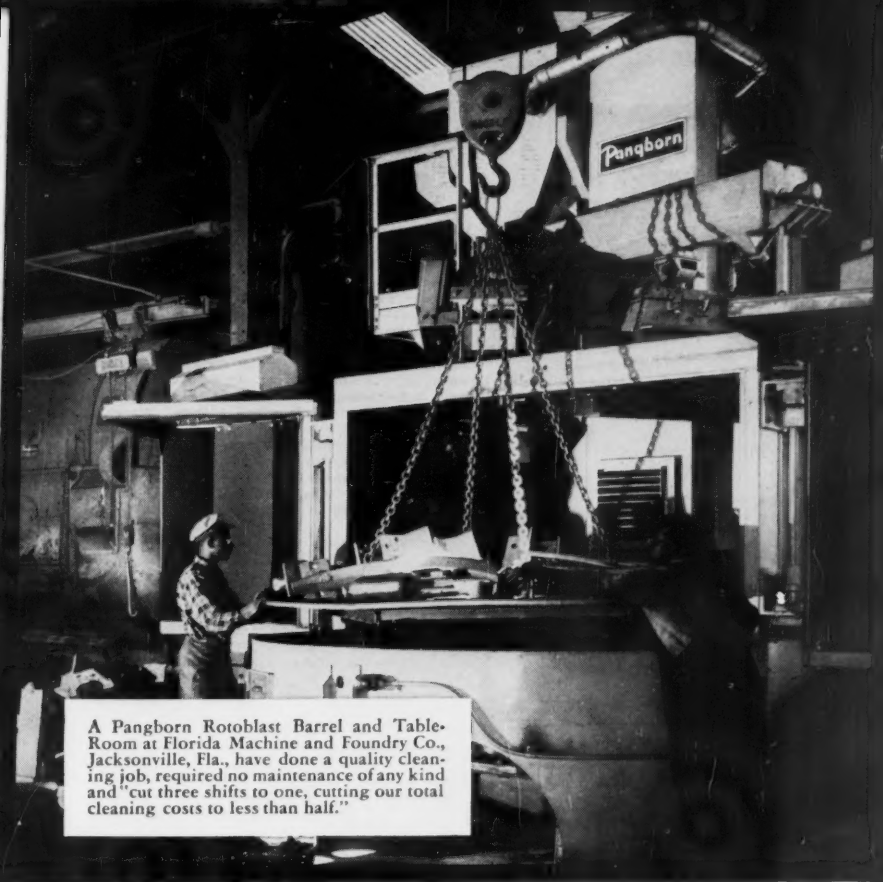
—o—

Earned Retirement: With the close of the year, I would like to offer congratulations to my Dad, Louis E. Steinebach of Plymouth, Ind., who is retiring as probation officer of the Marshall County Circuit Court at the age of 87. Dad has had an unusual record of 63 years of public service, during which he has been a teacher, principal, superintendent, county superintendent, director of vocational rehabilitation in the State Department of Education, and for the past 22 years, probation officer. For 36 years of that time he has had an office in the county courthouse which certainly is a record for those parts.

But Dad's service extended beyond the regular line of work. When I was a youngster he was Clerk of the Town Board of Bourbon, Ind. He also was foreman of the Hook and Ladder Company of the volunteer fire department, and the town had some really big fires during those years. In Plymouth, he served for many years on the Public Library Board.

Dad's hobby is reading and his greatest interest is history. His favorite author is Bruce Catton, editor of *American Heritage*, an authority on the Civil War and author of the recent best seller *This Hallowed Ground*. As long as fine authors continue producing good books, Dad can be happy.

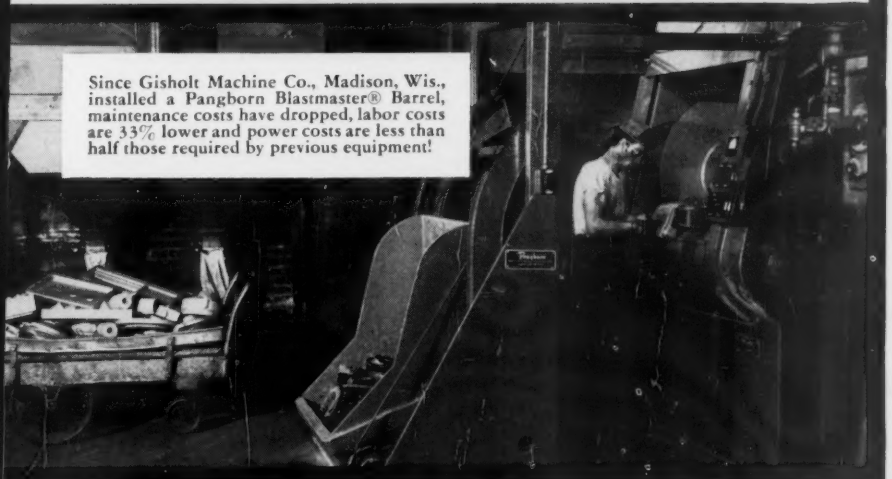
Dad, as you rest a while after so many years of service to the community, I hope you will find much in the way of happiness and contentment. F.G.S.



A Pangborn Rotoblast Barrel and Table-Room at Florida Machine and Foundry Co., Jacksonville, Fla., have done a quality cleaning job, required no maintenance of any kind and "cut three shifts to one, cutting our total cleaning costs to less than half."

Pangborn Rotoblast® cuts cleaning costs more than 50% at Florida Machine and Foundry!

And cuts maintenance, labor and power costs at Gisholt!



Since Gisholt Machine Co., Madison, Wis., installed a Pangborn Blastmaster® Barrel, maintenance costs have dropped, labor costs are 33% lower and power costs are less than half those required by previous equipment!

The efficiency of a blast cleaning operation is determined by the cost *per ton of castings cleaned.* This overall figure incorporates many cost factors—labor, power, maintenance, speed, abrasive.

Pangborn Rotoblast cuts these costs! Pangborn Rotoblast cleans quickly and automatically . . . production goes up, power and labor costs go down. Pangborn Rotoblast boasts rugged construction and unique design . . . maintenance costs drop, downtime is reduced, abrasive loss is eliminated.

Total these savings and you'll find Pangborn Rotoblast gives you *lowest cost per ton of castings cleaned.* Choose the Pangborn machine best for *you* and slash operating costs!

Write today for Bulletin 227 to PANGBORN CORPORATION, 1400 Pangborn Blvd., Hagerstown, Md. *Manufacturers of Blast Cleaning and Dust Control Equipment.*

Pangborn

BLAST CLEANS CHEAPER

Rotoblast Blastmaster® & Continuous-Flo Barrel

Rotoblast® Tables & Table-Rooms

Special Blast Rooms & Cabinets

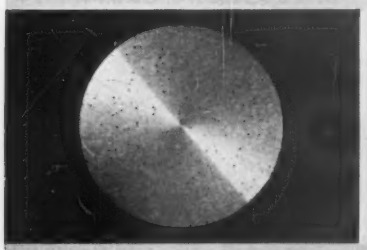
Pangborn Dust Control Equipment

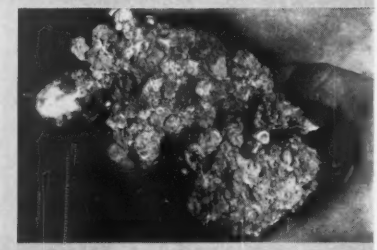
Distributors for Malleabrasive and Tru-Steel Abrasives

5-8

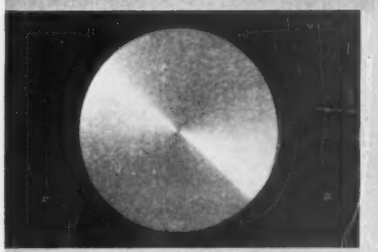
Circle 563 on Inquiry Card—Page 201

Costly gassy and oxidized aluminum castings and metallic drosses like these





are eliminated



with Foseco® Coverals and Degasers

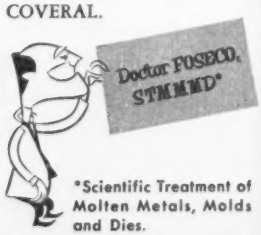
And it's so easy to produce sound aluminum castings the FOSECO way. Just:

(1) Heat crucible and charge ingot and/or scrap.

(2) Dust on a layer of FOSECO COVERAL.

(3) Melt charge completely and plunge FOSECO DEGASER TABLETS.

(4) Dross-off with another small quantity of FOSECO COVERAL.



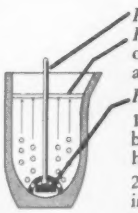
*Scientific Treatment of Molten Metals, Molds and Dies.

THE PROBLEM

Tough oxide film which forms on the surface of untreated molten aluminum.

Suspended particles of oxide (alumina), some of which are in contact with hydrogen gas. The oxide film prevents the hydrogen from rising to the surface.

THE SOLUTION

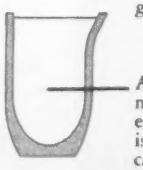


Plunger

Foseco Coveral Flux has absorbed the oxide into the dross which can be easily and cleanly skimmed.

Foseco Degaser decomposes to:

1. Liberate chlorine vapors which combine with and effectively remove the hydrogen.
2. Sweep all other impurities, including oxides, to the surface.
3. Break the surface tension of the metal by dissipating the oxide film, completely removing the last traces of gas and entrained oxide from the melt.



THE RESULT

A clean, gas and oxide-free aluminum melt, ready for pouring. Drosses are exceptionally low in metallics, fluidity is improved and strong, pressure-tight castings are produced.

FOUNDRY SERVICES, INC.

2000 BRUCK STREET — COLUMBUS 7, OHIO

In Canada: FOUNDRY SERVICES (CANADA) LTD., 201-7 Alice St., Guelph, Ontario

Send this coupon for these free leaflets giving all the facts about treating aluminum alloys.

Name_____

Company_____

Address_____

City_____ State_____

CALENDAR of Meetings

Jan. 18—Malleable Founders' Society semi-annual meeting, Hotel Cleveland, Cleveland.

Jan. 28-29—Industrial Heating Equipment Association, annual meeting, Shoreham Hotel, Washington.

Jan. 28-31—Plant Maintenance and Engineering Show, Public Auditorium, Cleveland.

Feb. 4-8—American Society for Testing Materials, committee week and spring meeting, Benjamin Franklin Hotel, Philadelphia.

Feb. 7-8—Malleable Founders' Society, 2nd technical and operating conference, Wade Park Manor, Cleveland.

Feb. 14-15—Wisconsin Regional Foundry Conference, Hotel Schroeder, Milwaukee.

Feb. 21-22—Southeastern Regional Conference, sponsored by Birmingham and Tennessee chapters, AFS, Dinkler-Tutwiler Hotel, Birmingham.

Mar. 13-14—Foundry Educational Foundation, college-industry conference, Hotel Cleveland, Cleveland.

Mar. 15-16—California Regional Conference, Claremont Hotel, Berkeley.

Mar. 18-19—Steel Founders' Society of America, annual meeting, Drake Hotel, Chicago.

Mar. 25-29—American Society for Metals, Western Metals Congress and Exposition. Ambassador Hotel and Pan-Pacific Auditorium, Los Angeles.

Apr. 10-11—Malleable Founders' Society, market development conference, Edgewater Beach Hotel, Chicago.

Apr. 12-13—East Coast Regional Conference, sponsored by Metropolitan, Chesapeake and Philadelphia chapters, AFS, Benjamin Franklin Hotel, Philadelphia.

Apr. 29-May 3—Seventh National Materials Handling Exposition, Convention Hall, Philadelphia.

May 6-10—American Foundrymen's Society, 61st annual convention and castings exhibit, Cincinnati.

May 20-24—Design Engineering Show, Coliseum, New York City.

June 13-14—Malleable Founders' Society, annual meeting, Broadmoor, Colorado Springs, Colo.

June 16-21—American Society for Testing Materials, annual meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

June 20-21—American Foundrymen's Society, 2nd annual foundry instructors' seminar, Kellogg Center, Michigan State University, East Lansing, Mich.

June 23-25—Alloy Casting Institute, annual meeting, Homestead, Hot Springs, Va.

June 27-28—Refractories Institute, annual meeting, Greenbrier, White Sulphur Springs, W. Va.

June 20-22—Penn State Foundry Conference, sponsored by Pennsylvania State University in co-operation with AFS chapters in New York and Pennsylvania and several independent foundry groups. Pennsylvania State University, University Park, Pa.

Sept. 17-20—American Die Casting Institute, annual meeting, Edgewater Beach Hotel, Chicago.

Sept. 23-24—Steel Founders' Society of America, fall meeting, Homestead, Hot Springs, Va.

Sept. 26-28—Missouri Valley Regional Conference, sponsored by St. Louis, Tri-State, and Mo-Kan chapters, AFS, and Missouri School of Mines Student Chapter. Missouri School of Mines and Metallurgy, Rolla, Mo.

Oct. 9-11—Gray Iron Founders' Society, annual meeting, Drake Hotel, Chicago.

Oct. 12-15—Conveyor Equipment Manufacturer's Association, annual meeting, Grand Hotel, Point Clear, Ala.

Oct. 17-19—Foundry Equipment Manufacturer's Association, annual meeting, Greenbrier, White Sulphur Springs, W. Va.

Nov. 4-8—American Society for Metals, national metals exposition and congress, International Amphitheater, Chicago.

Nov. 7-8—National Foundry Association, annual meeting, Waldorf-Astoria Hotel, New York.

Nov. 11-13—Steel Founders' Society of America, technical and operating conference, Hotel Carter, Cleveland.

. . . You'll cut snagging time—and save money on cleaning room costs—when you switch to CINCINNATI (PD)° SNAGGING WHEELS, the greatest grinding development in years.

Users all over the nation report that they like the fast, easy cutting action of CINCINNATI (PD) SNAGGING WHEELS. Our customers report, too, that POSITIVE DUPLICATION (PD) means another saving. "On grade" with a CINCINNATI (PD) WHEEL means all future (PD) WHEELS will act and grind exactly alike.

CINCINNATI (PD) WHEELS are made in vitrified and resinoid bonds for both ferrous and non-ferrous foundries and are available in a complete variety of sizes and shapes. *And these better, cost-cutting* (PD) SNAGGING WHEELS *are priced no higher than ordinary wheels.*

So, if snagging problems have you yelling for help, throw your voice in the direction of your CINCINNATI Grinding Wheels distributor and get full details on (PD) WHEELS. Or, contact us direct. Write, wire or telephone Sales Manager, Cincinnati Milling Products Division, Cincinnati 9, Ohio.

CINCINNATI°
Grinding Wheels
A PRODUCTION-PROVED PRODUCT OF
THE CINCINNATI MILLING MACHINE CO.

°Trade Mark Reg. U. S. Pat. Off.

YOU'LL DO A BETTER JOB

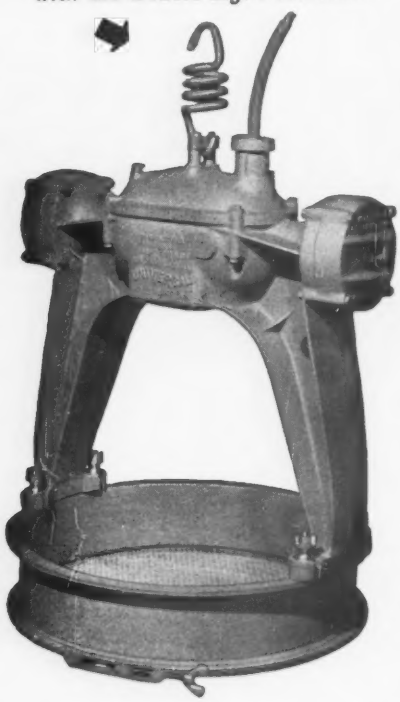
with **H. V. ADAMS DESIGNED**

HIGH EFFICIENCY FOUNDRY TOOLS

"UNIVERSAL FREE WHEELING"

FOUNDRY SAND RIDDLE

with the Double Eight Vibration

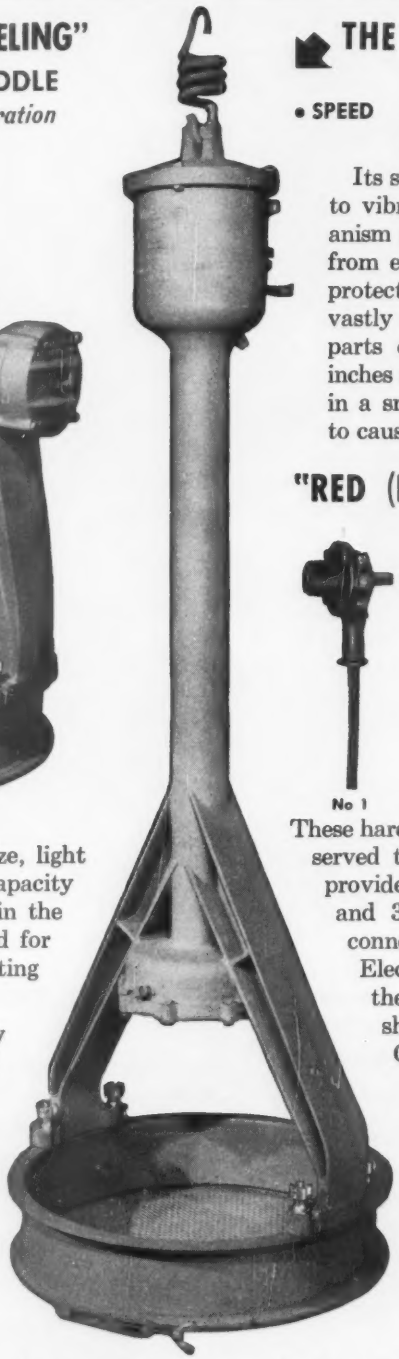


Because of its convenient size, light weight and good riddling capacity it long has been a favorite in the foundry. It also can be used for mixing core sand or for sifting sand directly into molds.

The mechanism is entirely enclosed protecting it from harmful dust and grit.

The main frame is cast in very strong tough aluminum.

It uses quick change ferruled sieves with 20 in. diameter sifting area. There are no loose wires to harm hands.



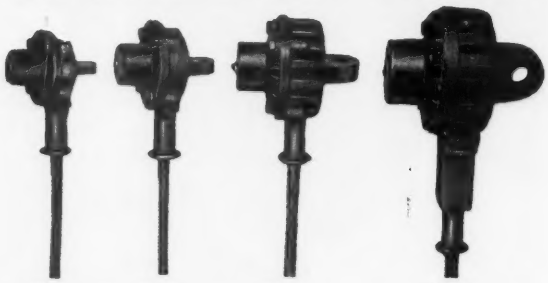
THE "ROTOPLANE" SPEED SIFTER

WILL GIVE YOU

- SPEED
- ECONOMY
- SAFETY
- LONGER LIFE
- GREATER SIFTING CAPACITY

Its sturdy one-piece frame and long shaft add to vibration effectiveness. The sealed-in mechanism assures protection of motor and bearings from exposure to dust and grit. This sealed in protection and "Rotoplane's" free-rotary action vastly increase bearing life. No exposed moving parts endanger the operator. Sieves have 20 inches diameter clear sifting area — are mounted in a smooth steel ferrule with no jagged edges to cause dangerous cuts and scratches.

"RED (Devil) ELECTRIC" VIBRATORS



No 1 No. 2 No. 5 No. 9

These hard hitting Adams designed Vibrators have served the foundries for over 30 years. They are provided with a 6 foot 3 wire authorized cable and 3 wire grounded connector which, when connected with our 3 wire grounded Red Electric Knee Switch, automatically grounds the vibrator protecting the worker from shock. The vibrators have passed the U. S. Government code inspection.

Other Foundry Products:

- No. 11 NOISELESS TYPE VIBRATOR
- A-20 ELECTRIC VIBRATOR
- RED ELECTRIC KNEE SWITCHES
- "ROTO" ADJUSTABLE BIN VIBRATOR
- 2 MIN. UNIVERSAL FINENESS TEST SIFTER.
- UNIVERSAL TRIPOD CARRIER

ORDER ALL SIFTERS AND VIBRATORS WITH GROUND WIRE!!

FOUNDRY SUPPLIES MANUFACTURING CO., NOT INC.

2221 Orchard Street - Chicago 14, Illinois

Established 1918 Cable Address: "Rotoplane Chicago" H. V. ADAMS, Mgr.

In This Leading Automotive Foundry, 500 to 600 tons of iron go through each of the big receiving ladles daily. A rammed lining of Norton ALUNDUM refractory cement, six inches thick, lasts 10 to 12 weeks, handling an average of 15,000 tons. Only occasional patching is required. The two-ton Crane monorail ladles handle 240 tons per day. Their linings of ALUNDUM cement, four inches thick, average 54 days of service life for a total tonnage of 13,000. About half these smaller ladles require patching, with the same Norton refractory material, after an average of 36 days' service.

Can your linings take this punishment?

Proof that ALUNDUM cement gives long life under heavy duty*

High-melting, long-lasting ALUNDUM cement is just one of many Norton ℞'s — refractories *engineered and prescribed* for longer, lower cost service across the range of furnace applications. Others include CRYSTOLON*, MAGNORITE*, and FUSED STABILIZED ZIRCONIA.

For ℞'s that will help maintain hot metal schedules and reduce shut-downs in your own furnaces, call in your Norton Refractories Engineer. Or write to NORTON COMPANY, 300 New Bond St., Worcester 6, Mass. *In Canada:* A. P. Green Fire Brick Co., Ltd., Toronto 5, Ontario.

Another Tough Spot for linings is this trough, in the same big automotive foundry. From 500 to 600 tons of molten iron pour through the trough every day. Bottom and sides, from dam to trough end, are lined with ALUNDUM cement. Average lining life is 11 to 12 days, during which approximately 6,000 tons of iron passes through.

NORTON

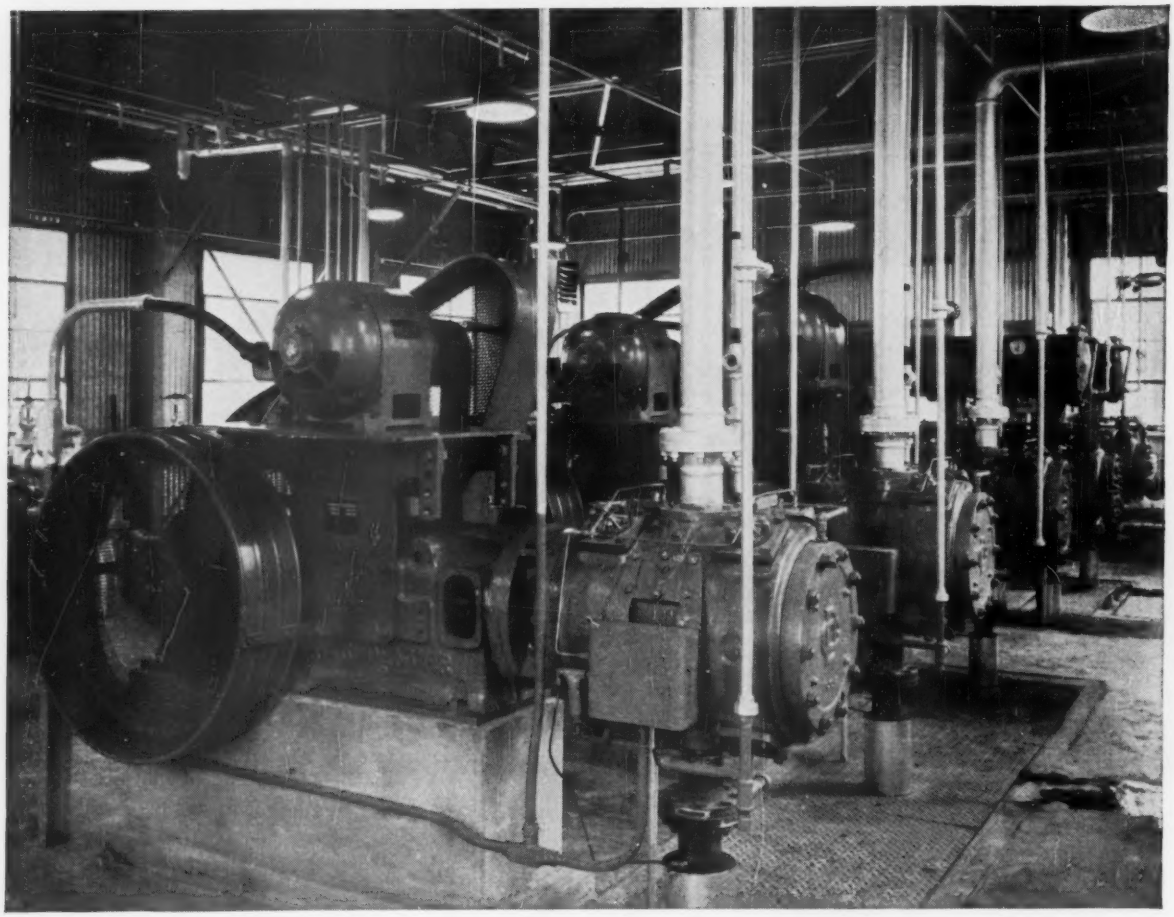
REFRACTORIES

Engineered... ℞... Prescribed

Making better products... to make your products better

NORTON PRODUCTS: Abrasives • Grinding Wheels • Grinding Machines • Refractories
BEHR-MANNING PRODUCTS: Coated Abrasives Sharpening Stones • Behr-cat Tapes
*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries

Gardner-Denver . . . Serving the World's Basic Industries



A roomful of compressors supplying instrument air . . . plant air . . . starting air . . .

it's 100% Gardner-Denver in this compressor room

Instrument air . . . furnished pure, clean and oil-free by two Gardner-Denver 10 x 9 CRX Carbon Piston Compressors.

Plant air for general use . . . supplied by a single Gardner-Denver 10 x 11 RX Single-Stage Compressor.

High-pressure air for starting diesel engines . . . supplied by two Gardner-Denver 9 & 4½ x 9 RXT Tandem Cylinder Compressors.

For any volume . . . any pressure . . . any use . . . your Gardner-Denver Compressor Specialist can fill your needs from Gardner-Denver's wide range of compressor types and sizes. Write for bulletins.

GARDNER - DENVER

THE QUALITY LEADER IN COMPRESSORS, PUMPS, ROCK DRILLS AND AIR TOOLS FOR CONSTRUCTION, MINING, PETROLEUM AND GENERAL INDUSTRY

Gardner-Denver Company, Quincy, Illinois

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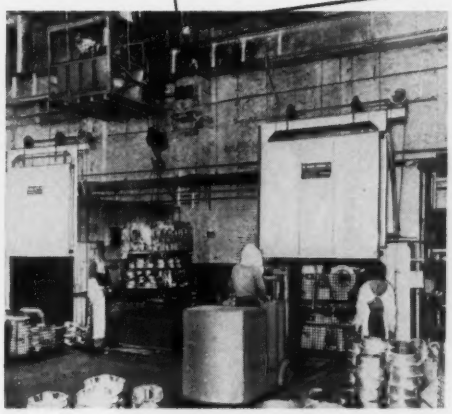
Circle 568 on Inquiry Card—Page 203

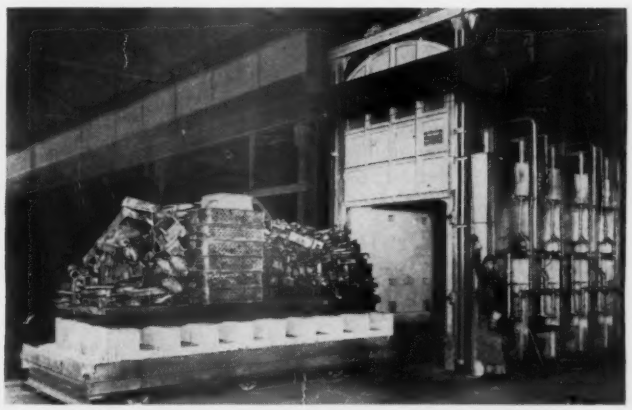
COLEMAN
OVENS and FURNACES

for... FERROUS and LIGHT METAL

Annealing • Normalizing • Tempering
Solution • Drawing • Stress Relief
Preheating • Ageing



Rack type ovens for ageing (left) and solution heat treat (right) of aluminum alloy castings.



Car type annealing furnace for steel castings, over-and-under-fired, features induced circulation of gases for temperature uniformity.

• Coleman Heat Treat Ovens and Furnaces combine soundly designed and thoroughly tested construction features with precise heating and accurate controls to produce the exact heat treating results desired.

Modern Coleman engineering methods and more than half a century of specialized experience assure you of lower over-all heat treating costs.

Coleman Engineers are available, without obligation, to recommend the type of oven or furnace best suited to your requirements . . . call or write, today.

Write for Bulletin 56-T.

Magnesium aircraft castings are solution heat treated in Coleman rack type SO_2 atmosphere ovens.

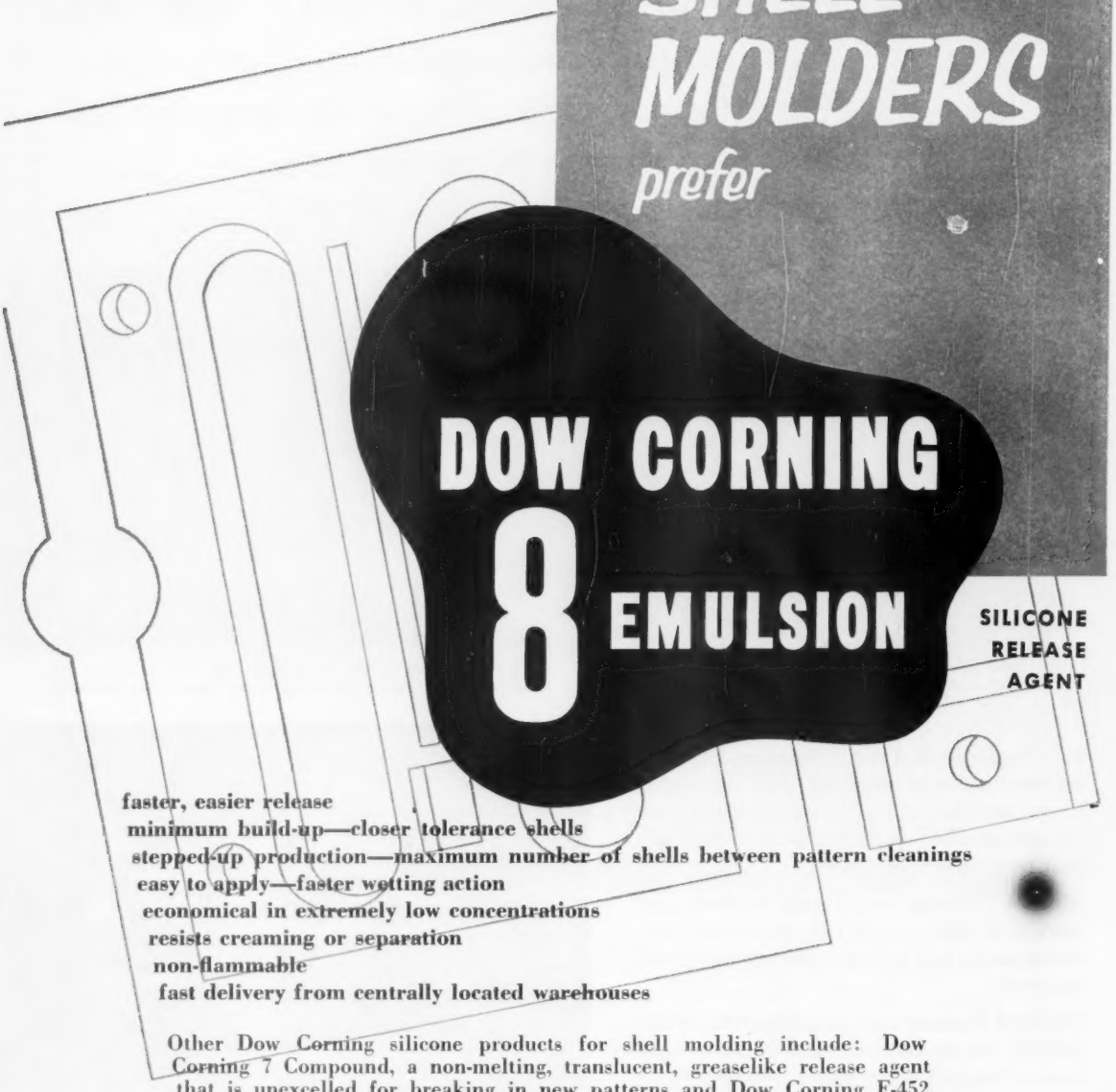
THE FOUNDRY EQUIPMENT CO.

1821 COLUMBUS ROAD — CLEVELAND 13, OHIO

World's Oldest and Largest Foundry Oven Specialists

8 REASONS WHY

leading SHELL MOLDERS prefer



DOW CORNING 8 EMULSION

SILICONE RELEASE AGENT

faster, easier release
minimum build-up—closer tolerance shells
stepped-up production—maximum number of shells between pattern cleanings
easy to apply—faster wetting action
economical in extremely low concentrations
resists creaming or separation
non-flammable
fast delivery from centrally located warehouses

Other Dow Corning silicone products for shell molding include: Dow Corning 7 Compound, a non-melting, translucent, greaselike release agent that is unexcelled for breaking in new patterns and Dow Corning F-452, a solvent type release agent.

first in silicones

DOW CORNING SILICONES

Generous *Free Sample* and latest data on request

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MIDLAND, MICHIGAN

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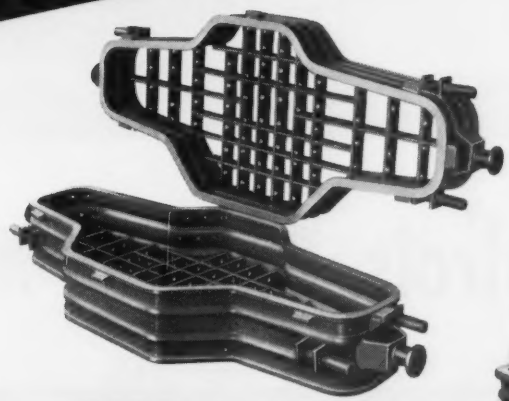
CANADA: DOW CORNING SILICONES LTD., TORONTO GREAT BRITAIN: MIDLAND SILICONES LTD., LONDON FRANCE: ST. GOBAIN, PARIS

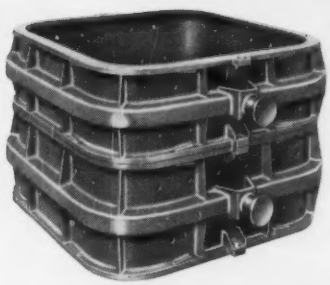
Everything in Steel Flasks

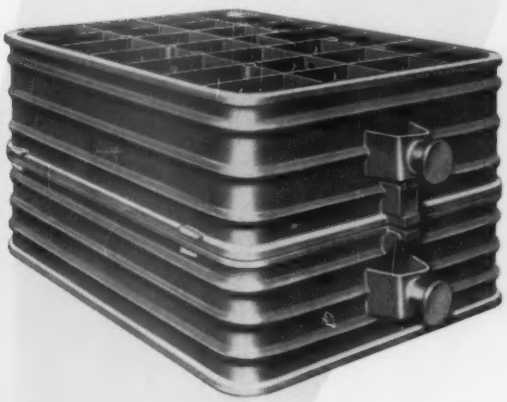
Shanafelt Steel Flasks are made in a full range of sizes and styles. With our new plant and new equipment, we can produce everything in steel Flasks, from the small One-Man sizes to large heavy duty equipment for crane handling.

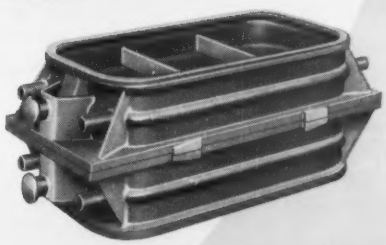
All Shanafelt Flasks are built to your own exact specifications. Handles, trunnions and pin lugs are placed just where you want them—bars are always accurately notched and inserted in correct position.

If you want new Flasks why not get our estimates of cost and delivery.









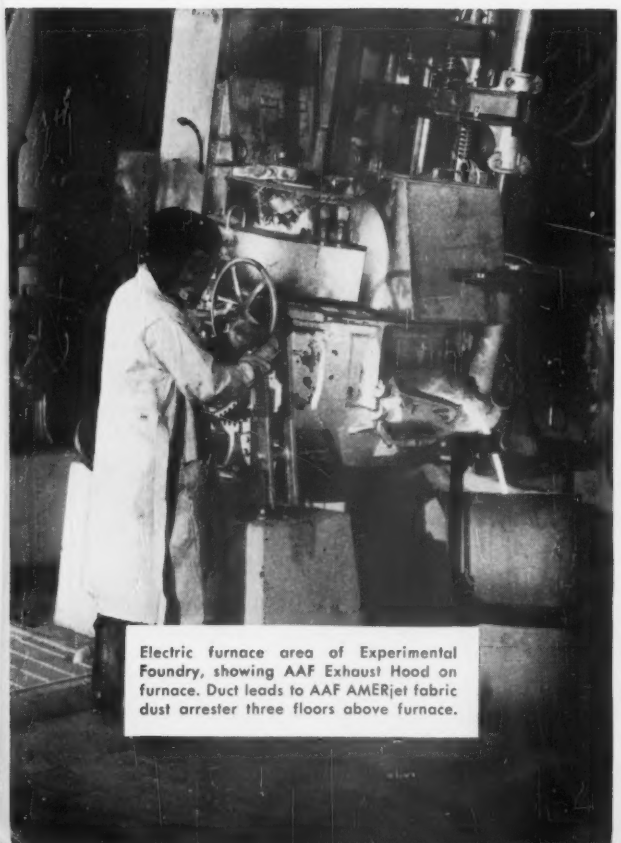
THE SHANAFELT MANUFACTURING CO.
2600-2700 Winfield Way N. E. Canton, Ohio

SHANAFELT

HARDENED STEEL
FLASK PINS & BUSHINGS
(So vital to good flask performance)
ARE SHIPPED PROMPTLY
FROM OUR LARGE STOCKS

General Motors Technical Center, Warren, Michigan. Central staff research, styling, manufacturing and engineering facilities are grouped around a 22-acre artificial lake — 25 buildings, ranging from gatehouses to laboratories, test cells and design studios.

AAF Controls Dust at New



Electric furnace area of Experimental Foundry, showing AAF Exhaust Hood on furnace. Duct leads to AAF AMERjet fabric dust arrester three floors above furnace.

One of the pattern shops. Process-dust exhaust ducts lead to AAF Skimmer Pre-cleaner (extreme right foreground)—one of five systems each with Airmat Dustbox final collector.

Process Development Staff's Experimental Foundry. AAF Type W ROTO-CLONES are on balcony at right, exhausting pouring and shakeout operations. White duct at left connects to unseen AAF Type N ROTO-CLONE exhausting shell molding operations.

General Motors Technical Center

Six different types of AAF products solve Center's varied dust problems

From this beautiful new General Motors experimental center will come many of the new methods, new designs, new products of tomorrow. *Though its function is experiment, there's nothing experimental about the center itself.* The 25-odd buildings are as functionally perfect as it was humanly possible to make them. All equipment was carefully selected—on proven performance records—to meet the punishing, day-to-day demands of GMC testing and experimentation.

As one of the very first users of AAF dust collectors, General Motors has had years of experience in putting these products to their stiffest tests in virtually every division of the company. Logically, when the new Technical Center was being planned, those plans included AAF dust control.

AAF manufactures a *complete* line of dust control equipment—dynamic precipitators, hydrostatic precipitators, dry centrifugals and fabric arresters. For the answer to *your* dust problem, call your local AAF representative, or write direct for folder 270-A1, *Five Basic Dust Problems.*

Herman Nelson Portable Heaters

Illinois Heating Specialties

AAF herman nelson

American Air Filter
COMPANY, INC.

266 Central Avenue, Louisville 8, Kentucky
American Air Filter of Canada, Ltd., Montreal, P. Q.

BETTER AIR IS OUR BUSINESS

AAF Electric Furnace Hoods

AAF Type K Exhauster

Make this simple test!

Convince yourself!

Something new has been added . . . to help you prove through comparative tests that Louthan Refractory Strainer Cores will save you money. If you are still making and using *sand* cores, your savings can be really substantial—through cutting scrap losses in castings and reducing "rework" costs.

Louthan Refractory Cores keep slag and sand-core inclusions out of castings, and permit closer control of the molten metal. They withstand 3000° F. temperatures without spalling or disintegrating. You'll also find them exceptionally uniform, dimensionally accurate, easy to handle, simple and economical to use.

To help you make comparative tests in *your* plant, under normal production conditions, we now have *core prints* of our standard strainer cores which can be easily attached to your patterns. We'll be happy to *give* you these and a reasonable quantity of the matching strainer cores. Simply tell us your sprue diameter (or ingate size) and we'll send them to you. Your only obligation is to *try* them and judge the results for yourself!

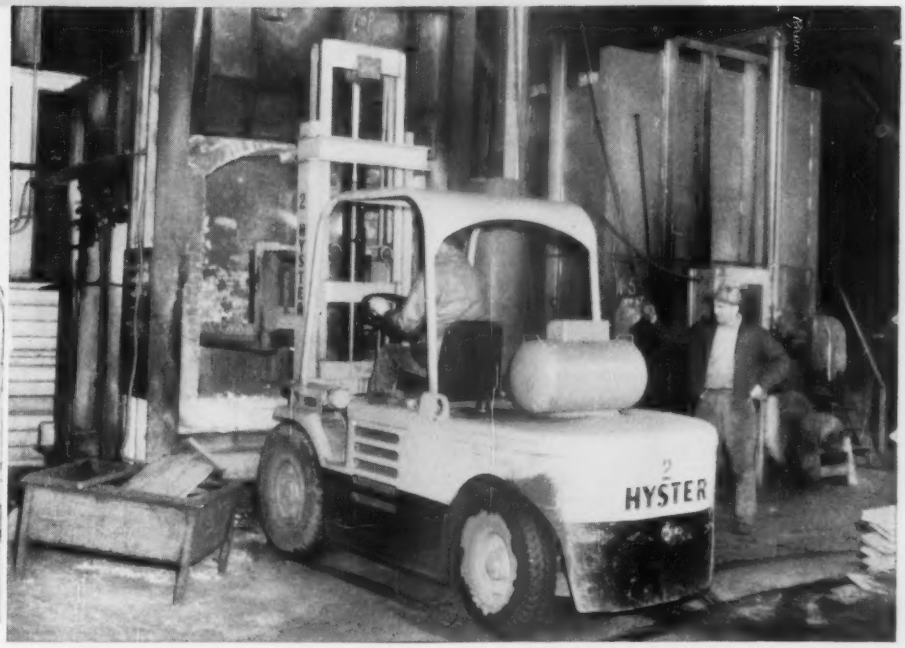
WRITE FOR
FREE SAMPLES
AND MATCHING
CORE PRINTS

Louthan **REFRACTORY STRAINER CORES**

Louthan Mfg. Co., East Liverpool, Ohio (Subsidiary of FERRO® Corporation)

REPRESENTATIVES: M. A. BELL COMPANY, St. Louis 2, Mo. . . Houston 3, Texas; **FOUNDRY SUPPLY COMPANY,** Minneapolis 16, Minn.; **MILWAUKEE CHAPLET & SUPPLY CORP.,** Milwaukee 46, Wisc. . . **FREDERIC B. STEVENS INC.,** Detroit 16, Mich. . . Indianapolis 7, Ind. . . Buffalo, N. Y.

HYSTER INDUSTRIAL TRUCKS ARE *BUILT* TO DO THE HEAVY WORK



LP-Gas equipped ZA-80 using special fork attachment, places and removes castings from heat treating furnaces. Hot materials remain on truck and are lowered to water quench tank and then moved to storage, finishing section or shipping department.

Pictured above is one of many typical examples of how Hyster® Industrial Trucks are helping to effect tremendous savings in the cost of materials handling in Foundries.

Even if you are now using lift trucks or have never used industrial trucks of any kind, your Hyster dealer can show you how you can quickly realize more profit from your operation with these multi-purpose utility tools. Your Hyster dealer knows materials handling . . . he is an expert on the problems and their solution. He can help you with special techniques and cost reducing methods. Call him today...why not take advantage of his materials handling know-how?

HYSTER DEALERS GIVE YOU ALL 3!

1 **PLANNING**—your Hyster Dealer will plan your materials handling operation from scratch, or will analyze your present system to see if it can be improved.

2 **THE RIGHT TRUCK**—for *your* job from Hyster's complete line of industrial trucks (1,000-30,000 lbs.) and over 100 job-attachments for economical load handling.

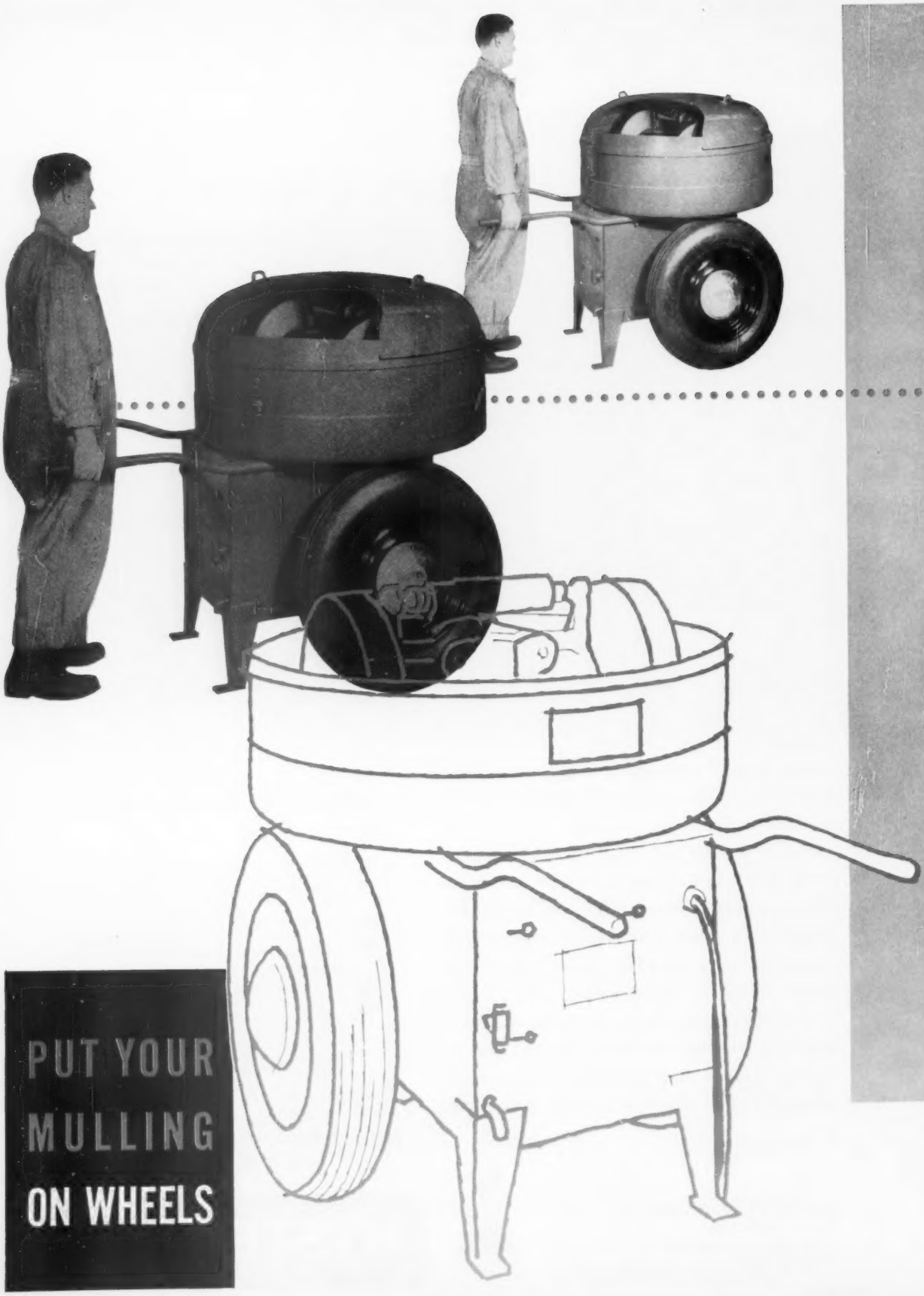
3 **THE RIGHT SERVICE**—ample spare parts stock, shop facilities, factory-trained mechanics and an efficient field service that keep your Hyster lift trucks going on your job, wherever your job might be located. Hyster trucks are noted the world over for their low downtime.

Materials Handling Trucks from 1,000 to 30,000 pound capacities

2902-30 N. E. CLACKAMAS, PORTLAND 8, OREGON
1010-30 MYERS STREET.....DANVILLE, ILLINOIS
HYSTER N.V. .....NIJMEGEN, THE NETHERLANDS
FOUR FACTORIES: Portland, Oregon; Danville, Illinois; Peoria, Illinois; Nijmegen, The Netherlands

HYSTER

HYSTER COMPANY



PUT YOUR MULLING ON WHEELS

ANY FOUNDRY HAS A JOB FOR SIMPSON Porto-Muller®

CO^2 process is another example of Simpson Porto-Muller versatility

Here's a completely self-contained, portable mixer "package" that can go anywhere in *any* foundry . . . to do a thorough *controlled* mixing job on any kind of sand.

From the toughest steel facing sand to the most intricate shell, "D" process or CO^2 sand Simpson Porto-Muller handles them all! And it's built to the same high engineering standards that has paired the name Simpson with practical and dependably economical mixing practices for over 40 years.

The Simpson Porto-Muller is designed around the fact that it's cheaper and easier to bring the *muller* to small or special mixing jobs, than it is to bring the sand to the muller. That's why it's making real economy possible on hundreds of jobs where makeshift mixing practices formerly took a large toll in wasted core oils and binders. Pioneers in shell, "D" and CO^2 processing have relied on Simpson Porto-Muller, too —for dependably uniform blending of small batches.

Got a job for Simpson Porto-Muller? Whether it's a big one in a small foundry or a small job in a big foundry, Simpson Porto-Muller is a superior mixer on *any* job in *any* foundry . . . and it's a true package unit. You just plug it in and start mixing!

MIX ANY SAND, ANYWHERE IN YOUR SHOP

MOLDING OR FACING

Bentonite
Fire Clay
Cereal
Pitch
Gravel

Sand and binder are intimately blended. True mulling action disperses *all* binder, coats *each* grain.

CORE SANDS

oil or resin bonded

Intimate blending, maximum dispersion of expensive binders cuts costs while it improves finish and effective strength of core.

SHELL SANDS

dry bonded or liquid coated

Used by pioneers and recommended by leading resin producers. Fills popular capacity range . . . yet can be used for other jobs in shop. Effective mulling is the real answer to binder segregation problems.

SPECIAL MIXES

CO^2
Asphalt Base
Sulphate
Liquors
Silicates
Gums

Spring loading arrangement permits adjustment of effective muller pressure to fit job at hand. Users report Porto-Muller ideal for use on new CO^2 formulas.

HERE'S A NEW BULLETIN ON THE SIMPSON PORTO-MULLER
It's just off the press . . . shows dimensions, specifications and testimonial reference. Write for your copy today!

National Engineering Company

646 Machinery Hall Bldg. • Chicago 6, Illinois

FOR CLEANER . . . SMOOTHER CASTINGS . . .
all the time

DELTA PYROKOAT-G WASH

Recommended For Use On Molds and Cores For Gray Iron and Non-Ferrous Castings.

DELTA PYROKOAT-S WASH

Recommended For Use On Molds and Cores For Steel and Malleable, also For All Types of Metals with the CO_2 Process.

Use DELTA PYROKOAT-G PYROKOAT-S CORE & MOLD WASHES

Dip, brush, spray or swab PyroKoat wash uniformly . . . but sparingly . . . over the core and mold surfaces.

●

Air dry, ignite, torch or oven dry immediately. When dry, the surface coating of PyroKoat wash is high-refractory and waterproof.

●

Metal flows freely over the PyroKoat washed surfaces and castings are smoother, cleaner, free from flaws and imperfections.

●

Casting cleaning costs are reduced to a minimum. Production schedules are easier to maintain and foundry costs are reduced.

Delta PyroKoat washes are "protective" coatings for cores and molds. Casting surfaces are consistently better . . . smoother and cleaner. Scrap castings, due to core or mold surface ruptures or imperfections are almost entirely eliminated. Production schedules are easier to maintain and costs are frequently sharply reduced.

PyroKoat-S wash is used extensively on CO_2 Process cores and molds with all types of metals.

Delta PyroKoat-G and PyroKoat-S are alcohol-type washes that can be applied by brush, spray, swab or dip to cores and molds. Immediately after application, the wash should be ignited, torched or oven dried. It may also be allowed to air dry. When dry it forms a smooth, high-fusion, highly refractory, waterproof surface over which molten metal flows freely without disturbance or danger of contamination.

DELTA

A working sample for test purposes will be sent to you at your request. Our representative will willingly cooperate and instruct in the proper use of the material to insure maximum effectiveness in use.

DELTA OIL PRODUCTS CO.

MANUFACTURERS OF SCIENTIFICALLY CONTROLLED FOUNDRY PRODUCTS

MILWAUKEE 9, WISCONSIN

Circle 576 on Inquiry Card—Page 201

TISCO®

REPLACEMENT BLADES to fit WHEELABRATORS*

LAST 6 TIMES LONGER

TISCO Replacement Blade — Manufacturers part numbers 36473 and 154069.

TISCO Replacement Blade — Manufacturers part numbers 47130 and 143600.

TISCO 150-Y Blades for Wheelabrators* are now harder, thicker and have a smoother wearing surface. Combined, these factors guarantee a blade which lasts six times longer than competitive blades.

TISCO 150-Y High Chrome Alloy was developed especially for extreme abrasion. Close metallurgical control and rigid heat treating standards offer a superior blade which will keep your down time to a minimum.

TISCO blades are ground to accurate dimensions for easy replacement and precision balanced in sets to insure smooth, troublefree operation. You, too, can realize lower costs in your cleaning operations through the use of TISCO 150-Y blades. Why not contact us for more information?

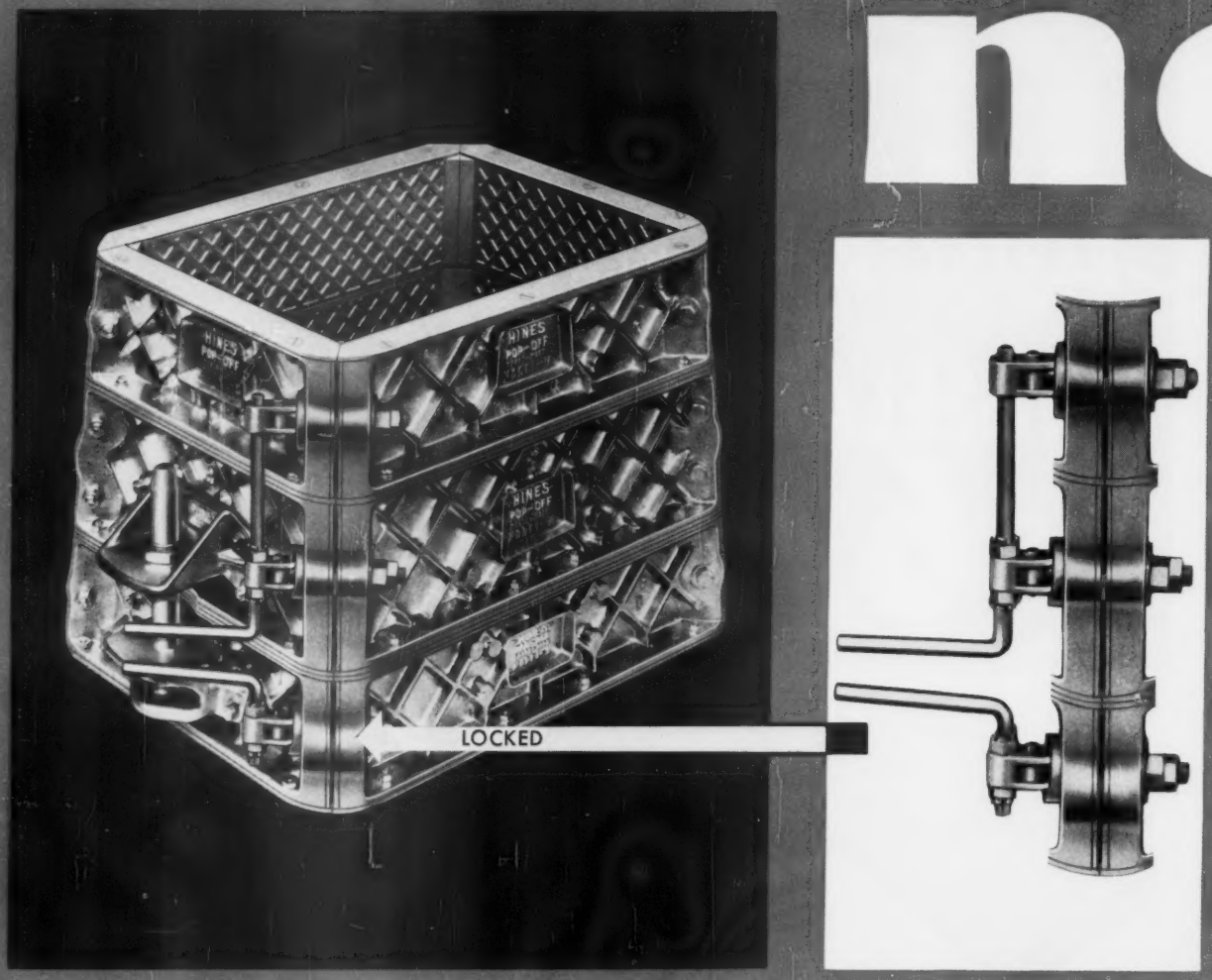
*Reg. U. S. Pat. off. by American Wheelabrator & Equipment Corp.

TAYLOR-WHARTON CO.

DIVISION OF HARSCO CORPORATION

HIGH BRIDGE 7, NEW JERSEY

Cincinnati, O. — Birmingham, Ala. — Easton, Pa.



HINES FLASKS now provide

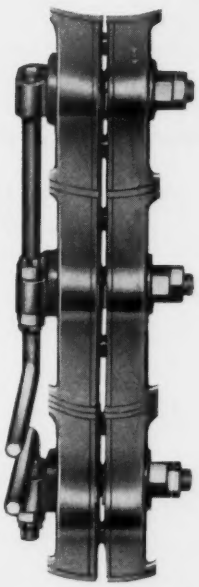
HINES
POP-OFF
FLASK

A new, improved locking mechanism is now available for HINES "POP-OFF" Flasks, to provide for opening two *or more* flask sections *simultaneously.*

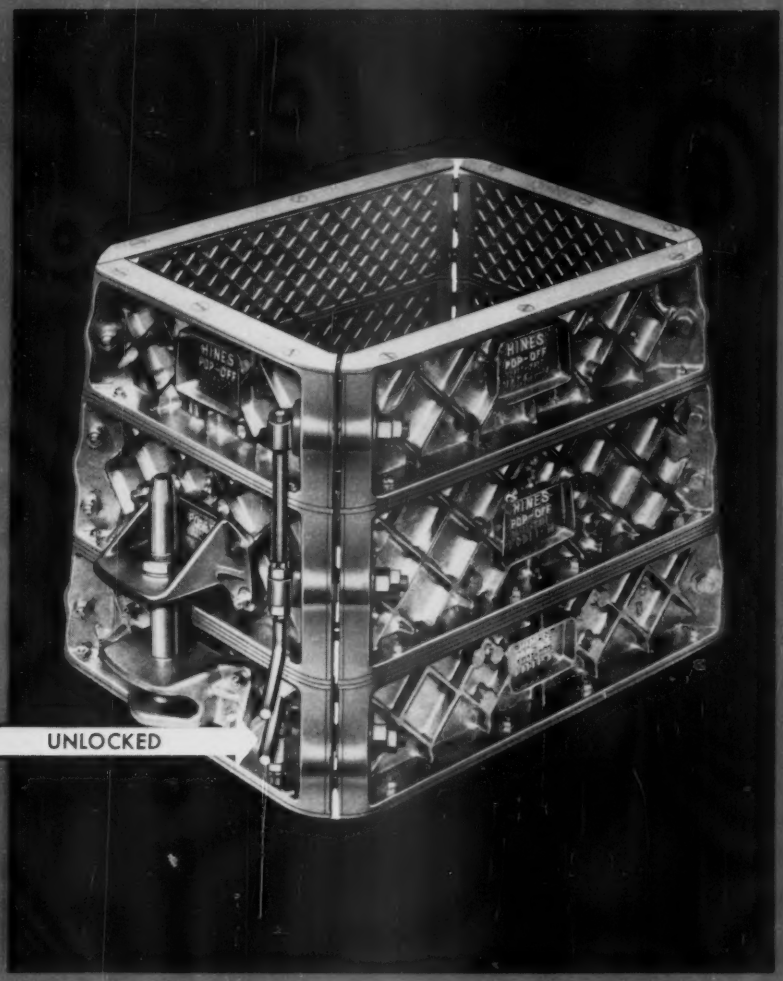
The three-section flask shown above (cope and upset, and drag) when previously equipped with individual levers for each section, required three operations to open each corner. With the new "POP-OFF" mechanism, turning the two control handles, together, unlocks all three sections in a single operation for each corner—quickly and smoothly.

THE HINES

ew



PATENTS PENDING



simultaneous "POP-OFF" action!

In addition to providing faster operation, this exclusive "POP-OFF" feature eliminates the strain exerted on flask and pins when each section is opened separately. Easier adjustment is obtained, as nuts and lock nuts are merely taken up to compensate for wear. Replacement, too, is a simple matter, if ever necessary.

The new locking mechanism may be obtained on all HINES "POP-OFF" Flasks. When next you're in the market for molding equipment, be sure to consider these new, faster-acting HINES Flasks for better molding—for better castings.

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION MEMBER FEMA INC.

FLASK CO. 3431 WEST 140th STREET • CLEVELAND 11, OHIO

Circle 578 on Inquiry Card—Page 203

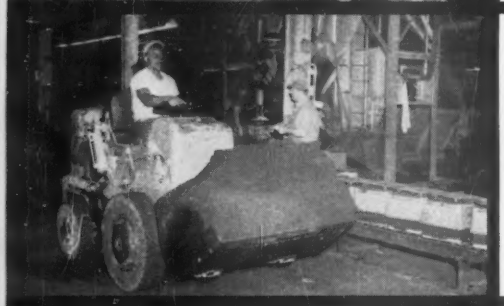
Better Engineered for Unequaled Production

Shortest Turning Radius

The model HA can work where others can't because it has a shorter turning radius than any comparable tractor-shovel — can go through narrow doorways and between spaces less than 4½ feet wide. With a turning radius of only 6 feet 3½ inches it easily turns corners of 6 foot aisles.

Higher Dumping Height

This "PAYLOADER" can deliver its loads over bin or hopper edges up to 6½ feet high. The bucket in maximum dump position can clear heights of 5 feet 2½ inches with a forward reach of more than 2 feet beyond front of machine. Loads can be dumped as fast or slow as desired, and at any height.



Biggest Capacity (18 cu. ft. payload)

With a bucket capacity of 18 cu. ft. payload and 14 cu. ft. struck the model HA has a carrying capacity up to 25% greater than all comparative machines and even more than some bigger, heavier machines. Better engineering including the exclusive 40° bucket tip-back action are the reasons the model HA handles more tons per load and more loads per hour.

Easiest Operating

The entire hydraulic control of the model HA bucket — tip-back, raise, dump, lower — is handled by a single conveniently located lever. It's the simplest, easiest bucket control available. Smooth hydraulic brakes, full anti-friction steering mechanism and torque-converter drive makes the model HA easy to operate at high output rates the full shift.

THE FRANK G. HOUGH CO.
703 Sunnyside Ave., Libertyville, Ill.

Send data on "PAYLOADER" tractor-shovels

- ☐ Model HA (18 cu. ft.) and HAH (1 cu. yd.)
- ☐ Larger models up to 2¼ cu. yd.

Name _____

Title _____

Company _____

Street _____

City _____

State _____

25

Greater productivity on sand handling work is only half the story of the Model HA "PAYLOADER". Its versatility is also valuable to many owners, because quickly-attached floor sweeper, fork-lift, and pusher fork attachments, plus special buckets are available to do many other jobs. You get more value in *any* "PAYLOADER" model because more "PAYLOADER" units are in service than all other wheeled tractor shovels combined, and there's a "PAYLOADER" Distributor ready to serve you right.

SAY "HUFF"

PAYLOADER®

MANUFACTURED BY
THE FRANK G. HOUGH CO. LIBERTYVILLE, ILL.
SUBSIDIARY—INTERNATIONAL HARVESTER COMPANY

Circle 579 on Inquiry Card—Page 201

Late News

FORECASTS: "The industry expects to ship 15 million tons of gray iron castings in 1957" —Donald H. Workman, executive vice president, Gray Iron Founders' Society.

"Based on the present level of demand and projected requirements for the next year, 1957 is expected to exceed any previous year for production and use of ferroalloys and metals" —A. L. Foscue, president, Electro Metallurgical Co.

"With the new capacity scheduled for completion in 1957, industry leaders are predicting total shipments of over 4 billion pounds of aluminum products during the new year" —Donald M. White, secretary, Aluminum Association.

"The nation has achieved new high levels of economic activity in 1956, and the impetus can be expected to carry business along at a high rate for at least the first few months of the coming year. However, the business outlook for the rest of 1957 and beyond is somewhat clouded by two factors—rising production costs and the fact that profits have not shared in the economic advance seen on other fronts"—Ernest G. Swigert, president, Hyster Co. and National Association of Manufacturers.

OUTLOOK FOR CASTINGS: Shipments of castings in 1956 were moderately above 18 million tons, third highest yearly total in history. The drop from 1955 was 3½ per cent. Steel ingot production, incidentally, was off 2 per cent in 1956, a consequence of the mid-summer strike. Production of some types of castings also was cut by the strike. Steel and magnesium casting shipments moved counter to the over-all trend with gains of more than 20 per cent each over 1955.

The lag in automobile production was a big factor in cutting shipments of gray iron, malleable, aluminum and zinc castings during 1956. Outlook for these same materials is enhanced correspondingly by the 10 to 15 per cent increase predicted by the motor car industry for 1957 assemblies. Railroad requirements will continue to be an important prop to relatively good steel foundry operations. The heavy volume of planned industrial capital expenditures for plants and equipment—including machine tools—will provide one of the major outlets for castings in 1957.

PRICE INCREASES: Prices of some manganese and silicon alloys and all nickel-bearing alloys have been advanced by Electro Metallurgical Co. The increases average 5.6 per cent and range up to 8.5 per cent on standard ferromanganese. Silicon alloys are up 2 to 3 per cent.

International Nickel Co. of Canada and its subsidiaries have increased the price of refined nickel 9½ cents a pound. Corresponding advances have been made in prices of nickel and nickel alloys in the form of mill and foundry products.

AJAX MERGER: Ajax Engineering Corp., Trenton, N. J., and Ajax Electric Furnace Corp., Philadelphia, are combining their engineering, manufacturing and sales efforts. As of Jan. 1 all inquiries, orders and services will be handled from the offices of Ajax Engineering Corp., Trenton 7, N. J. Both companies make induction melting furnaces.

PERSONALS: Frank M. Robbins Sr. is retiring Dec. 31 as president of Ross-Meehan Foundries, Chattanooga, Tenn., after 38 years with the company. He will be succeeded by J. C. Lucas, executive vice president . . . Elmer E. Burk, recently sales manager, Crucible Steel Casting Co., Cleveland, has been appointed manager, Acme Steel & Malleable Iron Works, Buffalo . . . Jules J. Henry, formerly with Forest City Foundries Co., Cleveland, has joined Lavelle Gray Iron Foundry Corp., Anderson, Ind., as director of quality control . . . John W. Little has been elected president, Goslin-Birmingham Mfg. Co., Birmingham, to succeed Joseph T. Hartson on the latter's retirement Jan. 1 . . . A. F. Anzlovar, vice president-sales, Mercast Mfg. Corp., La

Verne, Calif., has been appointed vice president and assistant general manager . . . William C. Rowland, assistant foundry superintendent, Alten Foundry & Machine Works Inc., Lancaster, Ohio, succeeds Val Young, retired superintendent there .

OBITUARY: Roy A. Loder, chief inspector, Erie Malleable Iron Co., Erie, Pa., died Dec. 15 . . . George C. Kohl, former chief permanent mold engineer, Aluminum Co. of America, Cleveland, died in Fort Lauderdale, Fla., Dec. 16 . . . Garland T. Thayer, owner of the Thayer Foundry Supply Co., Charleston, W. Va., died Dec. 5 . . . Edward F. Henderson, time study operator for more than 20 years with Ferro Machine & Foundry Co., Cleveland, died Dec. 14.

DESIGN FORUM: Banner Iron Works, St. Louis, on Dec. 13 conducted a one-day "school" for its customers. Seventy-seven engineers from as far away as Texas and Pennsylvania attended. Walter Illig, executive vice president, highlighted the meeting with an explanation of minor design changes which had resulted in substantial cost savings. William Moore, general manager of the Meehanite Corp., showed why design tricks could keep casting costs to a minimum. A plant visit also was on the program. This type of meeting was in line with suggestions by design engineers as revealed in a recent survey by the Gray Iron Founders' Society.

CARBORUNDUM TO BUILD: A new multimillion dollar plant will be built by the Carborundum Co. at Van Wert, Ohio, for the manufacture of high-volume, vitrified abrasive wheels up to 14 in. in diameter. It is scheduled for completion in late 1957.

MISCELLANY: Production of primary aluminum through November totaled 1,530,000 tons, against 1,425,000 tons in the 1955 period . . . International Nickel Co. of Canada plans a $175 million nickel project in Manitoba which will provide a net increase of more than 50,000 tons annually in total capacity . . . Certificates of necessity granted by the government for accelerated tax amortization covering new or expanded facilities include one for $1,400,000 for Pelton Steel Casting Co., Milwaukee, and one for $1,457,500 for Dodge Steel Co., Philadelphia.

Prices of Foundry Metals and Coke

(As of Dec. 21, 1956)

FOUNDRY COKE

(Per net ton, f.o.b. ovens)

BEEHIVE	
Connellsville	$17.50-18.50
OVEN	
Birmingham	$27.60
Buffalo	29.50
Detroit	29.50
Erie, Pa.	29.50
Indianapolis	28.75
Kearny, N. J.	28.75
Milwaukee	29.50
Montreal, Que.	30.00
Neville Island (Pittsburgh)	28.25
New England, deld.	30.55
Painesville, O.	29.50
Philadelphia	28.50
St. Louis	28.50
St. Paul	28.50
Swedeland, Pa.	28.50
Terre Haute, Ind.	28.75

PIG IRON

(Per gross ton f.o.b. furnace)

	No. 2 Foundry	Malleable
Birdsboro, Pa.	$65.00	$65.50
Birmingham	59.00	63.00
Buffalo	63.00	63.50
Chicago	63.00	63.00
Cleveland	63.00	63.00
Duluth	63.00	63.00
Erie, Pa.	63.00	63.00
Everett, Mass.	63.75	64.25
Fontana, Calif.	70.50	....
Geneva, Utah	63.00	....
Granite City, Ill.	64.90	65.40
Lone Star, Tex.	59.00	....
Neville Island (Pittsburgh)	63.00	63.00
Swedeland, Pa.	65.00	65.50
Toledo, O.	63.00	63.00
Troy, N. Y.	65.00	65.50
Youngstown, O.	....	63.00

NONFERROUS INGOT

(Cents per pound, carlots)

BRASS AND BRONZE: Red brass, No. 115, 35.00; tin bronze, No. 225, 46.00; No. 245, 41.50; high-leaded tin bronze, No. 305, 38.50; No. 1 yellow, No. 405, 27.50; manganese bronze, No. 421, 30.75.

ALUMINUM: 99 per cent plus primary ingots 27.10. Secondary No. 12 alloy 23.50-24.00. Deoxidizing grades: No. 1 23.75; No. 4 21.75.

MAGNESIUM: 99.8 per cent notched ingots 36.00, f.o.b. Velasco, Tex. (10,000 lb or more).

COPPER: Electrolytic 36.00, delivered Connecticut valley.

ZINC: High grade 14.85 delivered. Die casting alloy No. 3, 18.00, No. 2, 19.00, delivered.

IRON AND STEEL SCRAP

(Consumer prices per gross ton delivered, except as otherwise noted)

	No. 1 Heavy Melting Steel	No. 1 Cupola Cast	Heavy Breakable Cast	Clean Auto Cast	Machinery Cast	Malleable	Short Steel Rails
Birmingham	$46.00-47.00	**$52.00-53.00	.....	.....	.....	.....	$76.00-77.00
Boston*	**53.00-54.00	**45.50-46.50	.....	.....	**46.00-47.00	.....	.....
Buffalo	62.00-63.00	**49.00-50.00	.....	.....	**54.00-55.00	.....	77.00-78.00
Chicago	64.00-66.00	50.00-51.00	.....	55.00-56.00	55.00-56.00	70.00-71.00	87.00-89.00
Cincinnati*	**62.00-63.00	**48.00-49.00	**47.00-48.00	.....	**59.00-60.00	.....	**82.00-83.00
Cleveland	64.50-65.50	59.00-60.00	50.00-51.00	57.00-58.00	60.00-61.00	71.00-72.00	86.00-88.00
Detroit*	**59.00	**49.00	**44.00	**54.00	.....	**54.00	.....
Los Angeles	55.00	**62.00	.....	.....	.....	.....	.....
New York*	58.00	46.00-47.00	50.00-51.00	.....	.....	.....	.....
Philadelphia	63.00	52.00-56.00	59.00	.....	60.00-61.00	68.00	82.00-83.00
Pittsburgh	66.00-67.00	54.00-55.00	52.00-53.00	.....	61.00-62.00	.....	81.00-83.00
St. Louis*	58.00	51.00	46.50	53.00	.....	.....	85.00
San Francisco	55.00	57.00	42.00	57.00	60.00	.....	.....
Seattle	54.00	54.00-56.00	46.00	.....	.....	.....	.....

*Brokers' buying prices. **F.o.b. shipping point

WHITEHEAD'S
MOISTURE CONTROLLED
NATURAL BONDED
DORCHESTER MOLDING SANDS AND GRAVELS

Guaranteed Moisture Content Not More Than 6%

LEADER IN FOUNDRY SANDS SINCE 1841

These natural bonded sands and gravels are widely used for Molds and Cores in Iron, Steel, Alloy, and Non-Ferrous Castings. They are noted for colloidal clay giving high green and dry strength. Because of low fines in the grain distribution, these sands have high permeability. Here are advantages you may expect from Whitehead's Naturally Bonded Moisture Controlled Dorchester Sands and Gravels.

1 ***Moisture Controlled Sands Do Not Freeze—***

a. Easier to unload . . . means lower unloading costs.
b. Reduces handling costs to and from storage bins.

2 ***Moisture Controlled Sands Are Economical—***

a. Sands with 15% moisture have 1700 lbs. sand and 300 lbs. water in each ton.
b. Moisture Controlled Sands with 6% moisture have 1880 lbs. sand and 120 lbs. water in each ton.
c. On each ton of Moisture Controlled Sands you *SAVE price of sand and freight on 180 lbs. of water.* Sand has just proper amount of moisture to eliminate dust hazard.

3 ***Ready for Use on Arrival at Foundry—***

a. Dorchester Moisture Controlled Sands and Gravels arrive with proper working moisture content so that they can be used at once.
b. Aids you in control of sands in foundry.

Whitehead Brothers
COMPANY

Established 1841

NEW YORK OFFICE
324 West 23rd St., New York 11, N. Y.

NEW ENGLAND OFFICE
17 Exchange Place, Providence 1, R. I.

Manufacturers of:

LYQUAGEIP
Ready-to-use core paste

DOB-IT
Ready-to-use core mudding compound

JOINT-SEAL
Plastic compound for perfect sealing

LYQUAFLOUR
For cleaner surface, better shakeout

LYQUAFACE
The liquid sand grain coating

NOW for longer, faster action in heavy-duty grinding . . .

SIMONDS

New IL BOND

IL Bond gives a distinctly different grinding action—cutting rate is increased *without* affecting wheel life. If your present *cutting rate* is satisfactory IL Bond in harder grade will give longer life. If your present *wheel life* is satisfactory IL Bond in same grade will increase cutting action. Write for descriptive bulletin.

What goes in here . . .

. . . Makes a BIG difference here!

CALL YOUR SIMONDS DISTRIBUTOR

LOCAL STOCK
FAST SERVICE

SIMONDS ABRASIVE COMPANY

Tacony & Fraley Sts., Philadelphia 37, Pa.

DIVISION OF SIMONDS SAW AND STEEL CO.

BRANCH WAREHOUSES: BOSTON, DETROIT, CHICAGO, LOS ANGELES, SAN FRANCISCO, PORTLAND

NOW you can have the fast cutting action of a softer grade with the long life of a hard wheel

It's in the wheel mix! Special chemicals and compounds added to conventional resinoid bonds provide an internal lubricant which increases the abrasive cutting action—yet retains long wheel life. Demonstrated and proved—in test after test—in steel mills, foundries and industry generally—on regular and semi-automatic swing frame grinders, on floor stands and portables.

Try

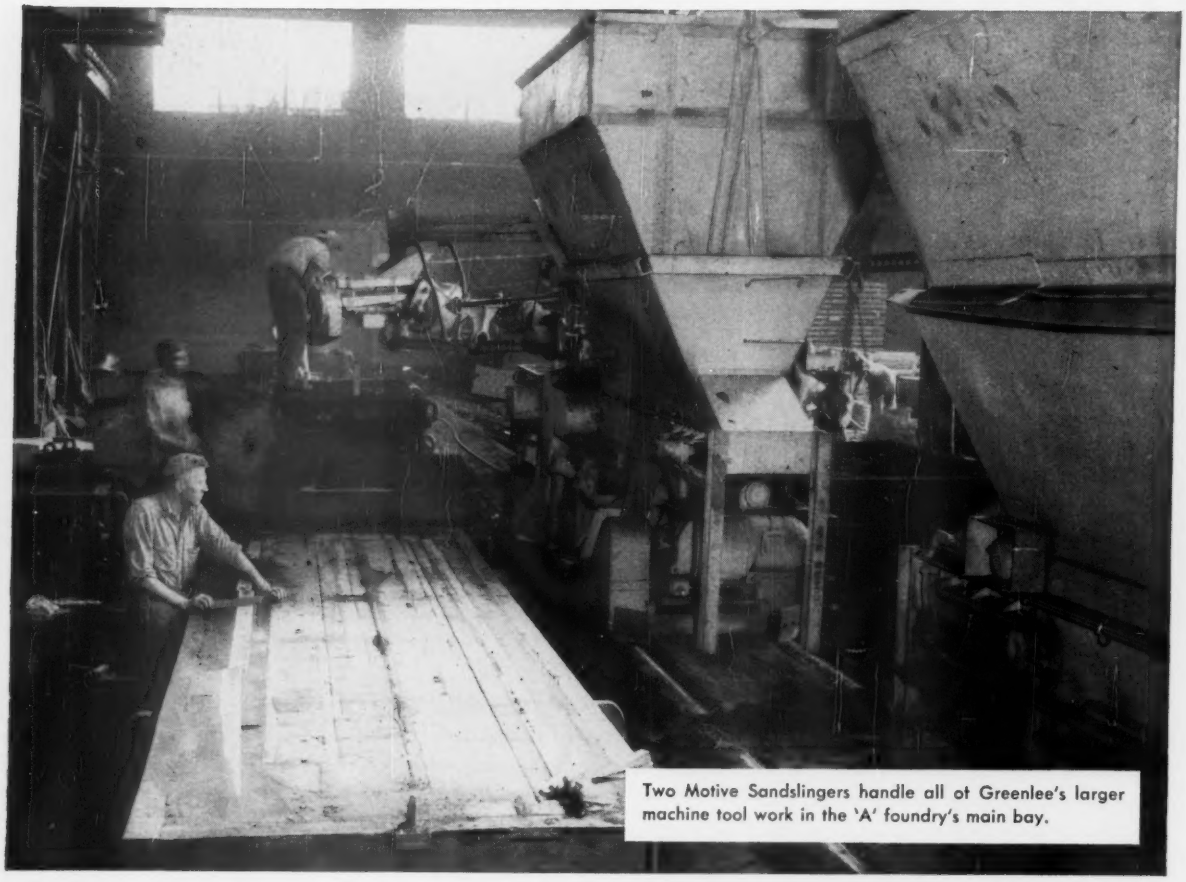
SIMONDS
ABRASIVE CO.

Available with Red Streak Flanges — for metal to metal fit on mounting equipment — another Simonds Abrasive exclusive.

SNAGGING WHEELS with *New* IL BOND

Circle 581 on Inquiry Card—Page 201

When FLEXIBILITY Counts!



Two Motive Sandslingers handle all ot Greenlee's larger machine tool work in the 'A' foundry's main bay.

No Other Method Can Approach Slinger Flexibility!

PROVED time and time before, and now proved again at Greenlee Foundry, Rockford, Illinois, the slinger provides flexibility far above that of any other method. In a normal day at Greenlee over 120 patterns are handled in the 'A' foundry, alone. The ability to change from job to job without loss of time is essential. That's why Greenlee uses three slingers—one Stationary and two Motives. They get all of the flexibility needed *plus* fast, efficient, uniform ramming.

Greenlee uses advanced mulling methods too. As an example, a Model '70' Speedmullor in the 'B', or production foundry, prepares all of the molding sand for 23 molding floors. An 1800 pound batch is prepared every 90 seconds. Send for your copy of November BETTER METHODS, featuring this foundry, today.

Beardsley & Piper, Div. Pettibone Mulliken Corp., 2424 N. Cicero Avenue, Chicago 39, Illinois.

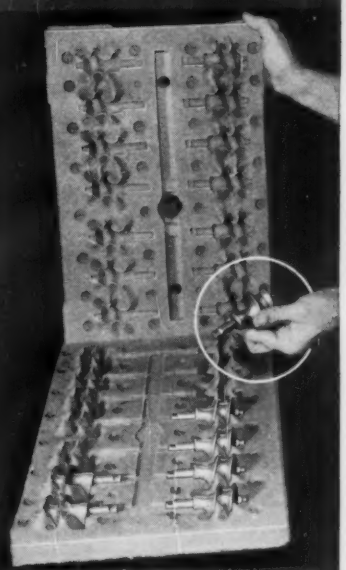
There's real flexibility in this Stationary Sandslinger installation serving both the roller conveyor and two pin lift molding machines.

THE WORLD'S LARGEST EXCLUSIVE MANUFACTURER OF FOUNDRY MACHINERY

FOR FASTER CURES...SMOOTHER SURFACES...BETTER CASTINGS

CATALIN SHELL MOLDING RESIN 9616

View of automatic shell mold machine, indicating shell ejection operation, shown to left... And a typical shell mold specimen, shown below... were photographed at the foundry of C. A. Goldsmith Company, Newark, N. J.



Higher production rates, new advanced techniques and automatic equipment, smoother and more accurate castings are the direct industrial contribution of the shell molding process . . . yet without fast-setting phenolic resins to bond the sand, the entire process could never have been possible! Since first introduced, too, shell molding resin formulations have also undergone self-transition periods of change and betterment.

Today Catalin Resin 9616, a two-stage, powdered phenol-formaldehyde resin, emerges as the very latest and best type of formulation.

This economical resin produces high-speed curing rates with the minimum of resin content. Savings are achieved in time, sand, work space, handling and metal. Castings are more accurate and smoother – require considerably less finishing.

In addition to Shell Molding Resin 9616, Catalin produces a wide range of core binding liquid resins and powders for the production of ferrous and non-ferrous metal castings.

Catalin representatives, familiar with the requirements of the foundry industry, are available for consultation. Samples on request! Write . . .

CATALIN CORPORATION OF AMERICA
ONE PARK AVENUE, NEW YORK 16, N. Y.

Catalin

BRANCH OFFICES: CHICAGO, ILL., 221 No. La Salle Street
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Custom Built in
any Length, Width or Depth

ADAMS CHERRY EASY-OFF FLASK

These advantages will cut your production costs!

SIDES AND ENDS finished 1⅛" on all standard size flasks. 1¼" and heavier on flasks of larger perimeters and depths. Cherry lumber is finest available; air dried.

SOLID CORNERS are machine locked to maintain alignment and to insure maximum rigidity.

MALLEABLE TRIMMINGS are another famous Adams feature; assure long life and exceptional service.

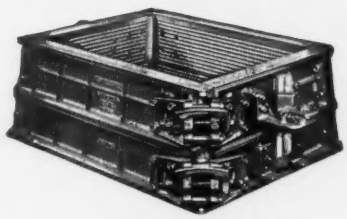
OPERATING MECHANISMS are completely new in design, yet of proven construction. Exceptionally simple, offering single-point adjustment; ease of operation on tough jobs.

ADJUSTMENTS made *only* when mechanism is in *locked* position.

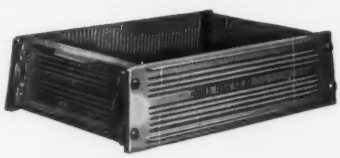
SPECIALLY DESIGNED INSERTS located in main body castings permit reversal of locking position. As "standard" flasks are furnished with handles locking in "up" position. To change, remove main bolt handles and inserts, reverse inserts and handles and reassemble.

STEEL PROTECTING STRIPS are standard equipment at top of cope, bottom of drag and at parting. Aluminum strips available upon request at no extra charge.

WIDE "V" PINS & EARS standard on all flasks. All other types of pin and ear arrangements are available to interchange with your present pattern plate guides.



Adams Aluminum Easy-Off Flask



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Adams Steel Jackets

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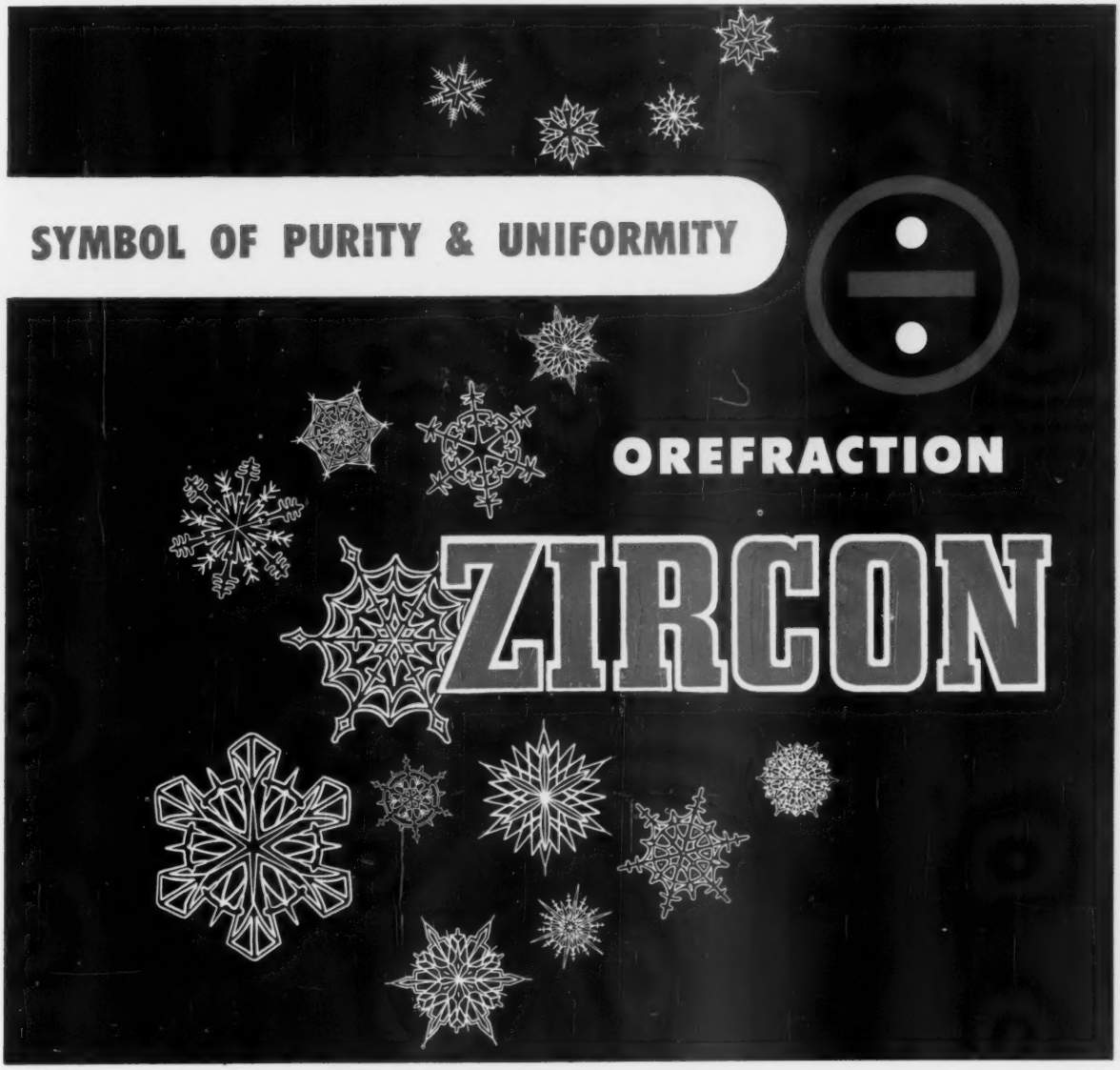
700 FOSTER STREET, DUBUQUE, IOWA, U.S.A.



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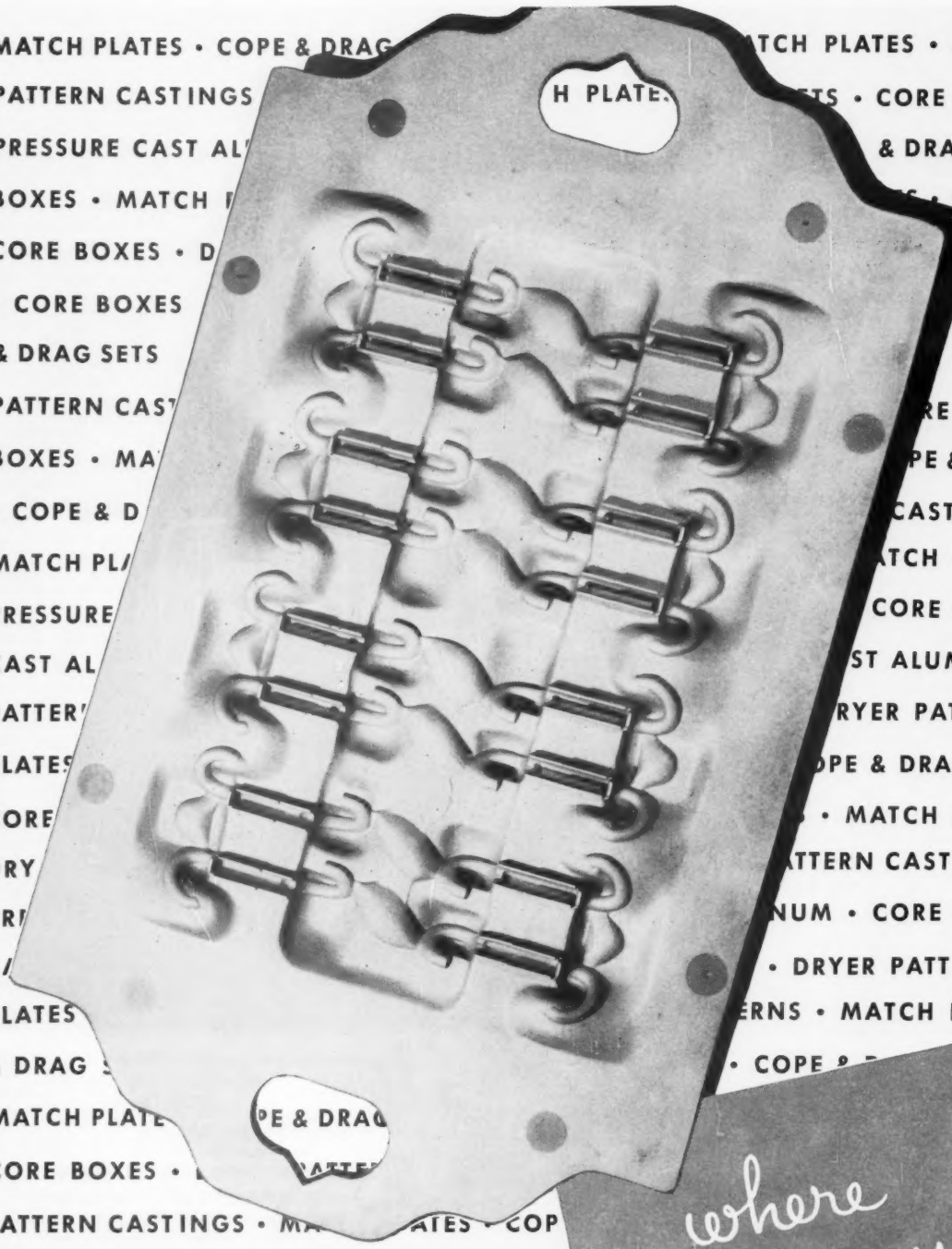

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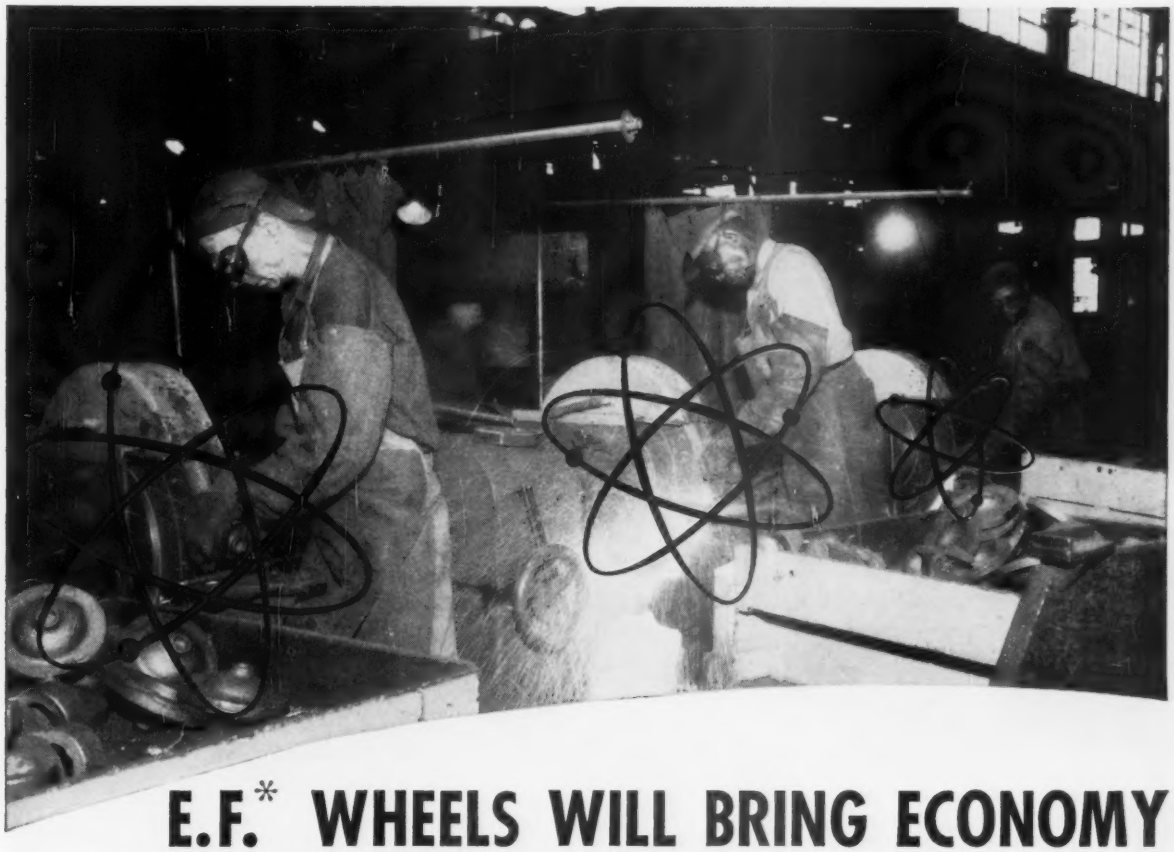

E.F.* WHEELS WILL BRING ECONOMY TO YOUR SNAGGING LINE!

* ELECTRONIC FORMULATION is the first use of an electronic "brain" to calculate grinding wheel ingredients.

Only fast, efficient grinding can clean up your castings at a profit . . . and this takes wheels that are "right" for the job.

That's where Bay State's ELECTRONIC FORMULATION helps you most. After our experienced representatives have determined the correct grinding characteristics for your job, "EF" automatically and without error, determines the exact amounts of ingredients for wheel manufacture. In addition, punched cards "remember" your specification and reproduce its formula, precisely, when you need replacements.

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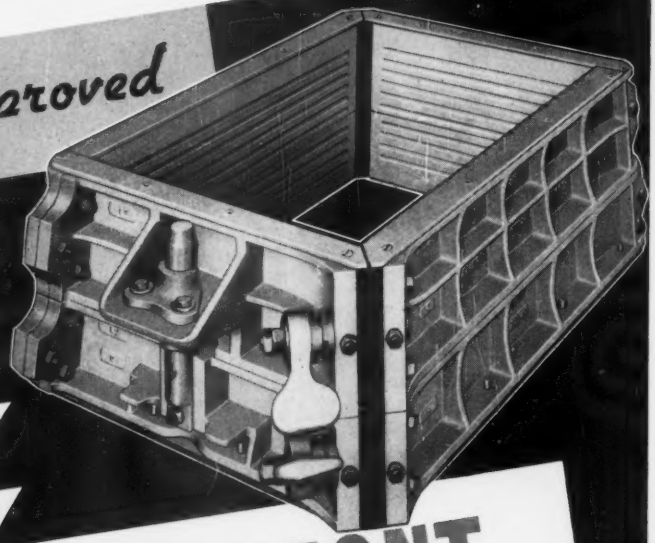
WHEELS of PROGRESS

The FLASK with the NEW BUILT-IN STRENGTH

the new improved



■ New two-piece male and female stop, inserted above and below the stud bolt, result in additional corner strength. Corner gaps completely closed by long-life, easily replaceable, live rubber corner inserts which prevent sand from lodging in corners.

■ Made of magnesium, which has twice the tensile strength of aluminum, with cams of hardened steel forgings, the Spread-lock really resists wear . . . assures long service.

■ Furthermore, magnesium weighs ⅓ less than aluminum, so they are light in weight, easier to handle.

■ The accurately machined inside surfaces and flanges, and steel-faced top and bottom flanges assure most exacting work.

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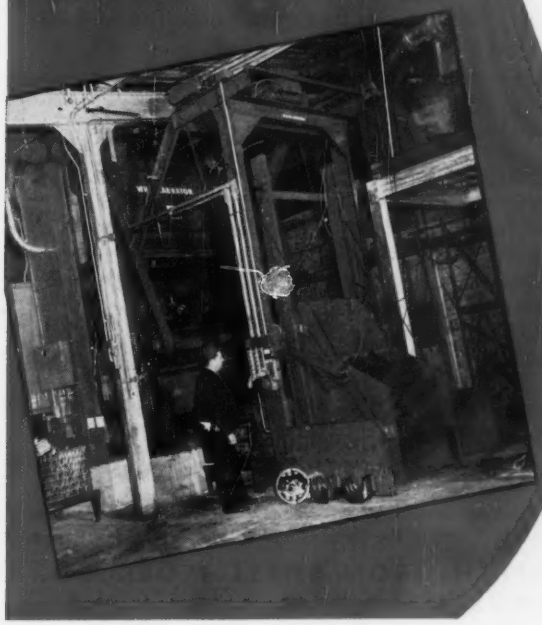
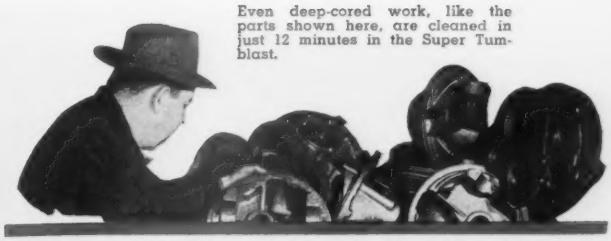
IN BATCH TYPE CLEANING THE BIGGEST SAVINGS ARE MADE WITH THE WHEELABRATOR SUPER TUMBLAST





Even deep-cored work, like the parts shown here, are cleaned in just 12 minutes in the Super Tumblast.

at Dayton Malleable Iron Co.

the WHEELABRATOR SUPER TUMBLAST

Cleaned 2827 tons of the toughest work as fast or faster than a 2-wheel machine and used *only* *one set of blades*

Saved 66.2% in Blade Costs
(Other Maintenance Costs Proportionately Low)

Saved 30% in Abrasive Consumption

The original blades lasted 696 hours, cleaned 2,827 tons of castings, at a cost of only 2.2c per wheel hour.

The tremendous savings promised for the Wheelabrator SUPER TUMBLAST are being delivered in actual performance. At the Ironton Division of Dayton Malleable Iron Company, for example, maintenance savings have been outstanding . . . the maintenance foreman says: "this machine is designed for the maintenance man."

The new Super-efficient Abrasive Separator is perhaps the greatest single cost-saving feature of the Super Tumblast because it affects so many areas. Having 3 times the air separation area of the conventional separator, it provides more effective and uniform removal of all abrading contaminants from the abrasive system without removing usable abrasives. It assures that super-clean abrasive is fed to the wheel at all times.

The Wheel itself is a new development of tremendous importance to cleaning economy because it throws more than twice as much abrasive as any similar sized wheel previously used. The wheel has new blades for longer wear, a strain-free blade holding device, a new easy-service guard housing, a new system of wheel guard liners . . . all designed to minimize maintenance.

Among the many other cost-reducing features designed into the Super Tumblast are the Super-Tight Cleaning Chamber that prevents jamming of the work, the Super-Sealed Door which prevents abrasive loss, and the use of Wheelabrator Long-Lyfe Parts at all high-wear points.

The Wheelabrator Super Tumblast will save YOU money . . . let us show you how. In the meantime, write for illustrated Brochure No. 125-D.

WHEELABRATOR

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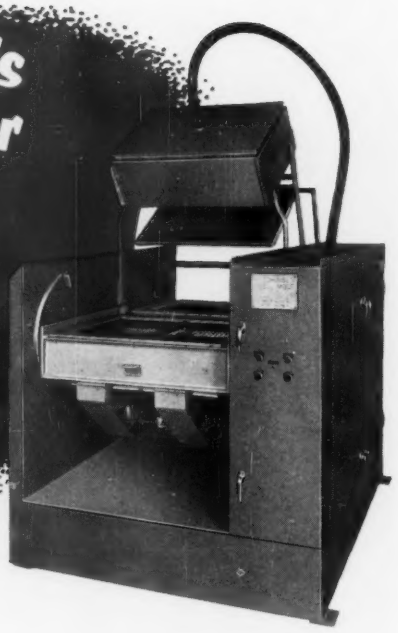
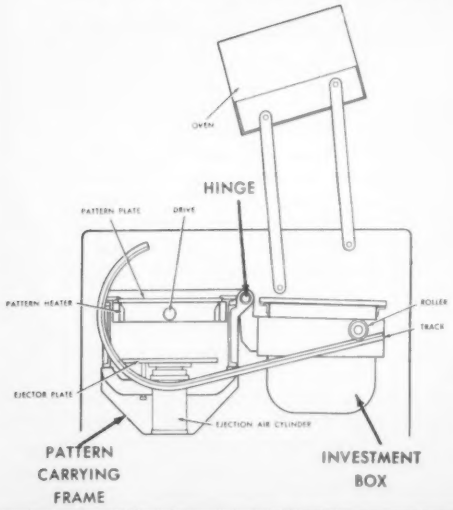
505 S. BYRKIT STREET MISHAWAKA, INDIANA

Production line molds in less time than ever before possible!

THE HUTCHINSON SHELL MOLD MACHINE



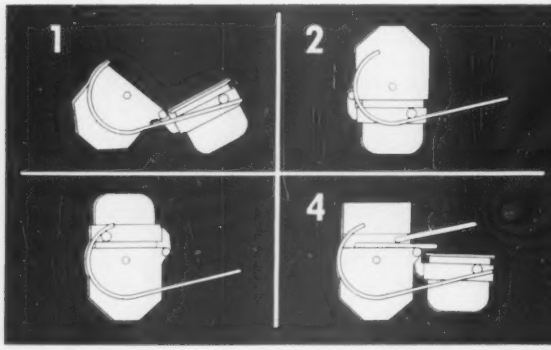
and here's the secret!



...THIS UNIQUE METHOD OF HINGING THE INVESTMENT BOX TO THE PATTERN CARRYING FRAME

A simple arrangement that cuts time and costs *3 ways!*

1. **FASTER OPERATING SPEEDS**—Simple patterns require as little as 37 seconds... more complicated patterns seldom require more than 60 seconds. Speed no other shell mold machine can match. Available in twin sets for additional operating efficiency.
2. **MORE OPERATING TIME**—A rugged machine specifically built for hard, repeated usage. Less maintenance... more service.
3. **FEWER REJECTS**—A precision machine, accurately controlled. Assures a more uniform product with exceptionally fine finish and close dimensional tolerances.



HERE'S HOW IT WORKS

(1) As the pattern carrying frame rotates, the investment box is drawn along its track until (2) it is booked to the pattern and (3) both are inverted. Centrifugal force and a set of simple fixed louvres retain the sand until the investment box is absolutely vertical—assuring a straight downward fall. Reverse rotation returns the pattern and box to original positions and (4) the oven positions over the pattern. All stages of the cycle are electrically controlled and can be varied to meet changeable conditions.

Model No.	Max. Shell Size	Heat	Length	Width	Height	Wt.
2030	20 x 30	Gas	65 in.	58 in.	100 in.	3200
1424	14 x 24	Gas or Electric	46 in.	46 in.	90 in.	1900
1418	14 x 18	Gas or Electric	46 in.	36 in.	90 in.	1700

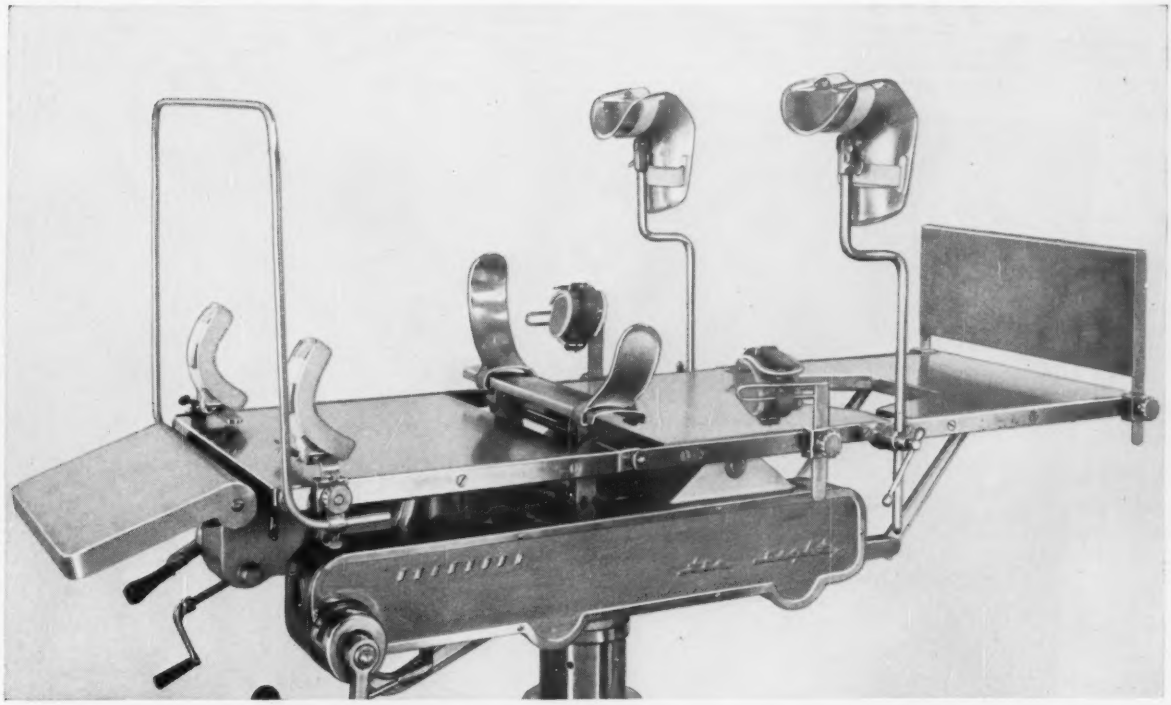
Electric—220/440, 60 cycle, 3 phase Air Pressure—100 psi

- **MANUAL OR AUTOMATIC CYCLE**
- **NATURAL OR MANUFACTURED GAS HEAT**

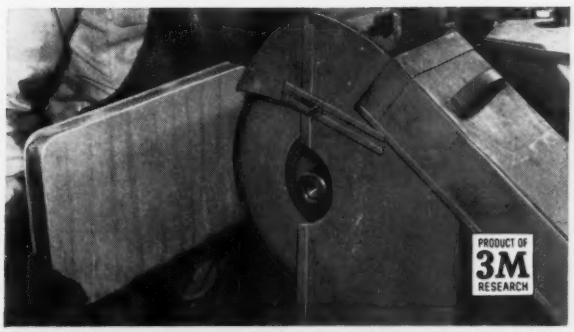
Write for our brochure "SHELL MOLDING" for a more complete description of the features and operation of this machine.

HUTCHINSON SHELL MOLD CO.
DEPT. B, 4131 ALBY ST., ALTON, ILLINOIS

3M METHOD–better from start to finish



3M Abrasive Belts increase production 25% on finishing of surgical table parts



3M Abrasive Belts are long-lasting production tools scientifically engineered to do better, faster grinding at lower cost to you.

American Sterilizer Co., Erie, Pa., made this saving when they switched to the Abrasive Belt Method for removing nibs, burrs and other imperfections from brass and aluminum castings. This company formerly used set-up wheels – a slow, costly method. When they switched to the 3M Method using Three-M-ite Resin Bond Cloth Belts, production on all the above castings jumped 25% with far superior pre-plating finishes. The 3M Method can help *you* increase production and cut costs in *your* foundry. Call your 3M Representative *today* or send coupon below.

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how to make your cupola operation more efficient

WHITING CORPORATION
HARVEY, ILLINOIS

Another WHITING Service

BULLETIN NO. FO-1

nearly anyone can obtain

Cupola Output

but it takes cupola specialists to make operation profitable!

Basically a cupola has always been a relatively simple melting unit. Yet, the full potential output and quality of melt from a cupola is not always obtained. Usually, there is more to cupola operation than "meets the eye" and Whiting analysis and engineering assures peak performance instead of average or below average results.

If you are planning the installation of a cupola now or in the near future, or even if you believe your cupola is operating successfully, it will definitely pay you to consider the latest developments that "tailor" the cupola to meet your particular metal requirements. Whiting has made many advancements, not only in cupola design but also in equipment used in conjunction with cupolas, that lead to better metal at lower costs.

In designing and planning a new cupola, for example, the application of scientific principles in construction and arrangement of tuyeres is necessary to provide the proper volume of air to the coke bed. Tons of coke a day can be wasted through mis-use or improper arrangement of tuyeres. Blast, blowers and many other operation factors should be investigated. Bottom door hoists and props, blast pressure gauges, blast line check valves, front slagging spouts, windbox vent valves, drop removal cars, water cooling and slag disposal are also to be considered.

Fortunately, a great deal can be accomplished with old cupolas. Usually they can be easily modified to incorporate the latest Whiting cupola accessories. This will result in increased cupola effectiveness, higher output rates and adherence to quality standards for molten iron. For seventy-two years Whiting has engineered and manufactured cupolas and cupola accessories. Whiting engineering service includes (1) analyses of requirements, (2) layout and selection of equipment, (3) manufacturing supervision, (4) supervision of erection, (5) initial operation, and (6) periodic field checkups. Talk over your plans now with a Whiting engineer!

WHITING CORPORATION, 15607 Lathrop Avenue, Harvey, Illinois

WRITE FOR THESE INFORMATIVE BULLETINS

Here are seven bulletins from Whiting's extensive library on cupola design and operation that will help you in considering improved methods and ways for obtaining maximum output from your cupola. Send for any or all of the bulletins you need—today! When ordering, please specify by "FO" number shown.

FO-7 Cupola blast control

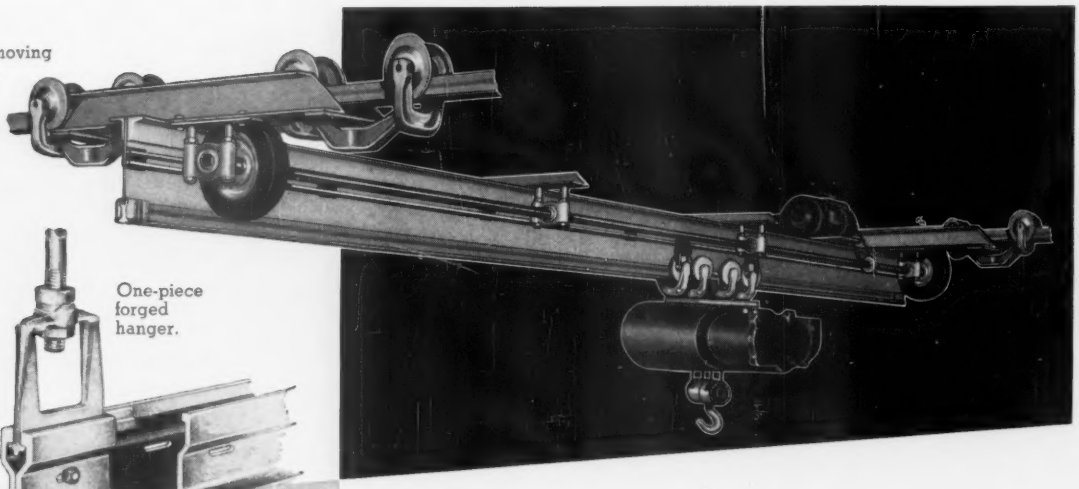
FO-3 Hot-blast

FO-5 Here's how to save melting fuel

FO-9 Review of foundry-cupola gasses and temperatures

FO-2 Tips on improving cupola charging

FO-8 Suggestions for solving some cupola operation problems



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One-piece forged hanger.

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Overlapping splice.

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Standard American Monorail units offering the many advantages illustrated, are combined into systems for handling any type of unit loads.

These systems are available for manual, electric or automatic operation with local or remote control.

Experienced Monorail engineers will tailor-make a cost-saving handling system from standard parts to fit your specific needs.

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means sand the same every time

SPECIFY BLACKHAWK SILICA, THE SAND WITH HIGH RESISTANCE TO CHEMICAL AND HEAT ACTION. OVER 99.7% PURE BY ACTUAL TEST

Blackhawk silica has the same purity, uniformity, and dependability with every order and in any quantity. That's what Standard specification means to you, Mr. Foundryman, whose product quality depends on the ingredients you use.

Standard's silica is mined from an area wonderfully rich in tremendous deposits of St. Peter's sandstone. Painstaking washing and grading processes produce foundry sands second to none in the world.

The Blackhawk brand possesses an unusually high sintering and fusion temperature point plus marked permeability which allows free passage of gases.

Standard's accessibility to both excellent rail and water transport facilities affords swift delivery anywhere in the nation. For your next order of silica sand, phone the Standard distributor in your area.

BLACKHAWK SILICA SAND

The Blackhawk brand—used throughout the foundry industry as steel molding sands, special core sands, opening and parting sands, and facing sands.

STANDARD SILICA COMPANY

STANDARD
Silica Company
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Silica Center of the World

over 8,000 Different Cylinder SELECTIONS—

Miller

AIR AND HYDRAULIC

CYLINDERS AND BOOSTERS

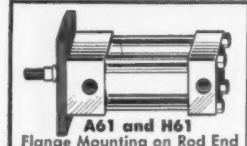
"IN STOCK"

for immediate delivery.

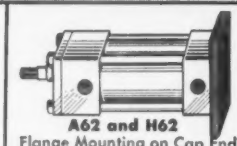
See Miller Bulletins A-105K (Air) and H-104K (Hydraulic) for Complete Dimensions and Engineering Data on these "in-stock" sizes and other Custom Miller Cylinders in bores up to 20" and strokes up to 22 feet.

"IN-STOCK" MODELS

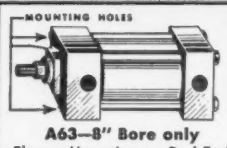
"A" Signifies Miller 200 psi Air Cylinders; "H", 2000 psi Hydraulic Cylinders. Interchangeable Mountings Are Shown In Red On Drawings.



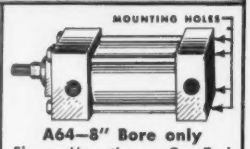
A61 and H61
Flange Mounting on Rod End
(A61 not available in 8" bore)



A62 and H62
Flange Mounting on Cap End
(A62 not available in 8" bore)



A63—8" Bore only
Flange Mounting on Rod End

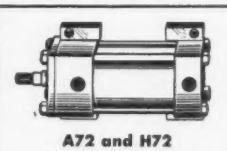


A64—8" Bore only
Flange Mounting on Cap End

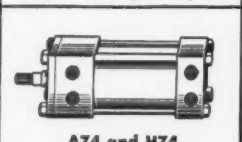
A50 & H50—Tie Rods not extended beyond nuts.
A51 & H51—Tie Rods extended both ends (shown).
A52 & H52—Tie Rods extended. Cap End only.
A53 & H53—Tie Rods Extended. Rod End only.
A54 & H54—Two Tie Rods extended at both ends.

H65—Hydraulic Only
Flange Mounting on Rod End

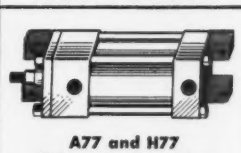
H66—Hydraulic Only
Flange Mounting on Cap End



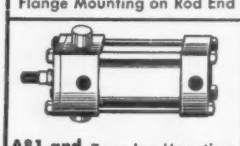
A72 and H72
Side Lug Mounting



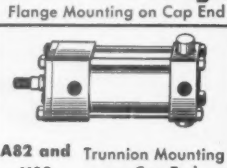
A74 and H74
Side Flush Mounting



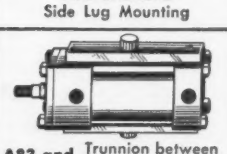
A77 and H77
Side or Foot Mounting



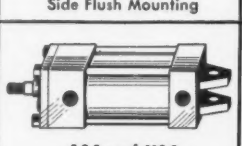
A81 and H81 Trunnion Mounting on Rod End



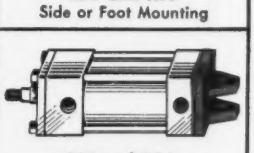
A82 and H82 Trunnion Mounting on Cap End



A83 and H83 Trunnion between Head and Cap
(one week delivery)



A84 and H84
Pivot Mounting



A86 and H86
Pivot Mounting

IN STOCK BORES In Inches

"IN-STOCK" STROKES (in Inches)

	BORES	ROD DIA.	ROD TURN DOWN & THREADS		1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
AIR	1½	⅝"	7/16-20	Cushioned			3	4	5	6	7	8	9	10	11	12									
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12									
	2	⅝"	7/16-20	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
	2½	⅝"	7/16-20	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
	3¼	1"	¾-16	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
	4	1"	¾-16	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
	5	1"	¾-16	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
	6	1⅜"	1-14	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
	8	1⅜"	1-14	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
HYDRAULIC	1½	⅝"	7/16-20	Cushioned			3	4	5	6	7	8	9	10	11	12									
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12									
	2	1"	¾-16	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
	2½	1"	¾-16	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
	3¼	1⅜"	1-14	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
	4	1¾"	1¼-12	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
	5	2"	1½-12	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36

(1) (2) (3) (4)

"A" and "H" Models 82, 84 and 86 with strokes over 18" require stop tubes.

Column strength requires larger diameter piston rods for the following:

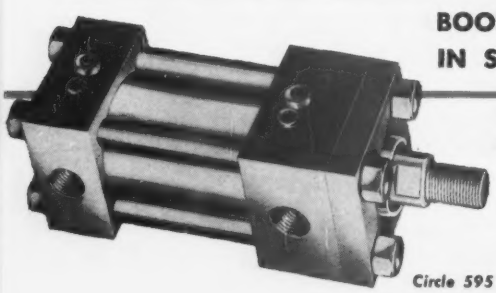
Air Cylinder Models A82, 84, and 86 with strokes inside area (1), when operated at 100 psi and over;

All hydraulic models with strokes inside area (2) and Models H82, 84, and 86 with strokes in area (4), when operated at 2000 psi and over;

Models H82, 84 and 86 with strokes inside area (3), when operated at 1000 psi and over.

Depending upon Trunnion Pin location, "A" and "H" Models 83 with standard diameter piston rods can have longer strokes than Models 82, 84 and 86.

See Miller File #251 for oversize piston rod and stop tube requirements.



BOOSTERS IN STOCK

Immediate Delivery on the following Miller 25 to 1 Ratio Boosters (80 psi air input produces 2000 psi hydraulic oil output): Model B4, 5" bore, 1" dia. ram, 6" and 12" strokes; Reciprocating Booster Model DA77-RBA8, 5" bore, 1" dia. ram, 6" stroke. Also Booster Tanks, 5" dia., 6" and 10" heights.

Write For Catalog and Stock Price List

Miller

MILLER FLUID POWER DIVISION
FLICK-REEDY CORP.

2034 N. Hawthorne Ave., Melrose Park, Ill.

AIR & HYDRAULIC CYLINDERS • BOOSTERS • ACCUMULATORS
COUNTERBALANCE CYLINDERS

Circle 595 on Inquiry Card—Page 201

LITHIUM METAL

by the GRAM or TON

Nearly a decade of experience producing Lithium Metal commercially is at the beck and call of the non-ferrous foundryman. Lithium is decidedly no stranger to this important, fast-growing industry. A unique element serving many unique purposes, Lithium's affinity for oxygen has for years been utilized to reduce porosity in copper and copper alloy castings. The result is a dense, oxygen-free electrical conductivity casting. Of yet further benefit is the amount of Lithium used as compared with the amount of end-product made. In the degasification, deoxidation and desulfurization of metals, for example, as little as 0.005% or 2¼ grams of Metallic Lithium make a sounder, more uniform non-ferrous casting. Cost, then, can also be a relatively insignificant factor. Put Lithium to work for *you*. Our banks of electrolytic cells can supply experimental grams or commercial tons of this admirably versatile metal. Write for details of actual foundry tests.

... trends ahead in industrial applications for lithium

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PROCESSORS OF LITHIUM METAL • METAL DISPERSIONS • METAL DERIVATIVES: Amide • Hydride • Nitride • SALTS: Bromide • Carbonate • Chloride • Hydroxide • SPECIAL COMPOUNDS: Aluminate • Borate • Borosilicate • Cobaltite • Manganite • Molybdate • Silicate • Titanate • Zirconate • Zirconium Silicate

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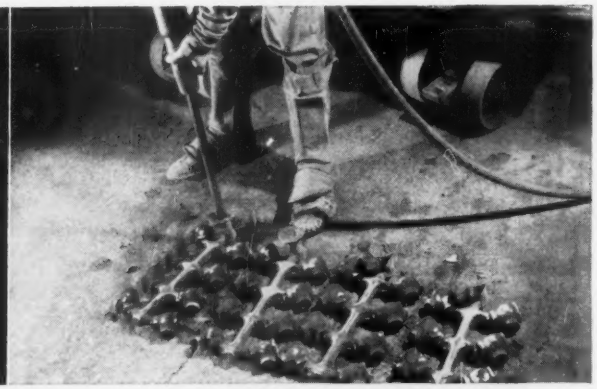
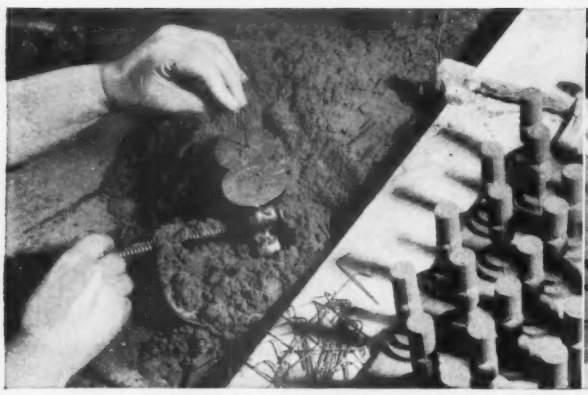
costly steps you can bypass

● No oven drying is necessary



● No core knock-out problem



● No reinforcing with wires and nails

● No patching operations

. . . with shell cores bonded with DUREZ 18250 RESIN

SHARPLY REDUCED COSTS in mass production of high-grade castings result from simpler procedures made possible by Durez 18250 phenolic resin for cold coating sand.

Operations started in a corner soon mushroom into profit-making business, crying for extra space.

This is what happened at the Marsh Valve Company, Dunkirk, New York. Labor and material costs were reduced and production rate was increased. Core driers and conventional oven baking operations were eliminated. Core setting was faster. Breakage due to handling was negligible. Wire or nail reinforcing and patching were no longer necessary. The shell cores were much lighter in weight; for example, one valve body core made with conventional core sand weighed 9 oz. versus 4 oz. for a corresponding shell core. Considerable savings were also evident in a faster and cleaner shell core shake-out.

Shells and cores bonded with Durez 18250 have good hot and cold strength. More economical resin-to-sand ratios can be used, while the fast cure of the resin means shorter production cycles. Resultant castings exhibit pattern-like surfaces with clean, sharp edges.

Order a trial shipment today, and let us show you how Durez 18250 cuts costly steps.

We will gladly send you our authoritative 16-page booklet covering simplified procedure, coating methods, solvents, test methods, etc. Ask for the "Durez Guide to Resin Coated Sand."

DUREZ®

Phenolic Resins that Fit the Job

DUREZ PLASTICS DIVISION

HOOKER ELECTROCHEMICAL COMPANY

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HOOKER® CHEMICALS PLASTICS

THE RIGHT ALLOY FOR ANY FOUNDRY NEED

ELECTROMET offers a complete line of ladle and cupola addition agents

Additions of ferro-alloys will adjust the composition of the base iron to make it suitable for the particular work on hand. You can reduce chill in thin-sectioned castings or improve strength and machinability. You can, if desired, increase hardness and improve resistance to wear and heat-all through the simple addition of alloys. And there's an ever wide variety of ELECTROMET alloys to choose from.

ELECTROMET not only has the alloys to meet your needs, but also furnishes technical assistance in their most effective use. Please phone or write the ELECTROMET office nearest you for detailed information on these or other ELECTROMET products.

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A Division of
Union Carbide and Carbon Corporation
30 E. 42nd Street UCC New York 17, N. Y.

In Canada: Electro Metallurgical Company, Division of Union Carbide Canada Limited, Welland, Ontario

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Electromet
TRADE-MARK

ALLOYS FOR LADLE ADDITIONS

Ferrosilicons (50%, 75%, 85%, and 90%) In grades and sizes suitable for all conditions in the iron foundry. Silicon reduces chill in thin-section gray iron castings.

"SMZ" Alloy—A strong, super-graphitizing alloy and chill reducer. Contains zirconium and manganese to enhance the inoculating properties.

Calcium-Silicon—Inoculant for reduction of chill and for developing high-tensile strength. Especially suited for use in low carbon-equivalent irons.

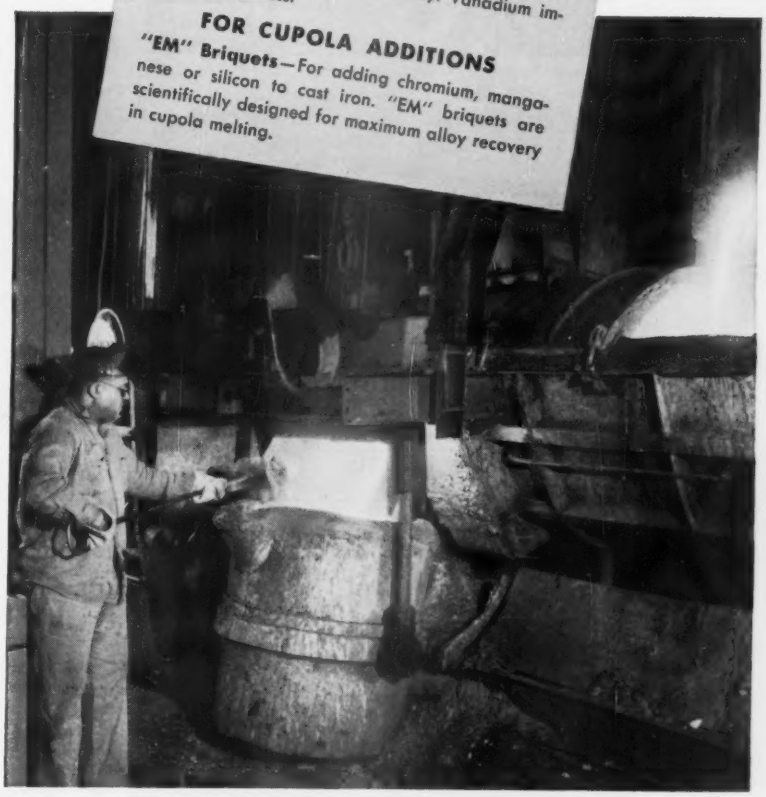
Zirconium Alloys (12 to 15% and 35 to 40%) Graphitizers for reducing chill, aiding machinability, and improving tensile properties.

Ferrochromium Alloys—Available in many grades for cast iron. All grades have rapid solubility. Widely used to improve the hardness, strength, and heat and wear resistance of cast iron.

Ferrovanadium—ELECTROMET foundry grade ferrovanadium has good solubility. Vanadium improves toughness.

FOR CUPOLA ADDITIONS

"EM" Briquets—For adding chromium, manganese or silicon to cast iron. "EM" briquets are scientifically designed for maximum alloy recovery in cupola melting.



Nation-wide service through these conveniently located offices:

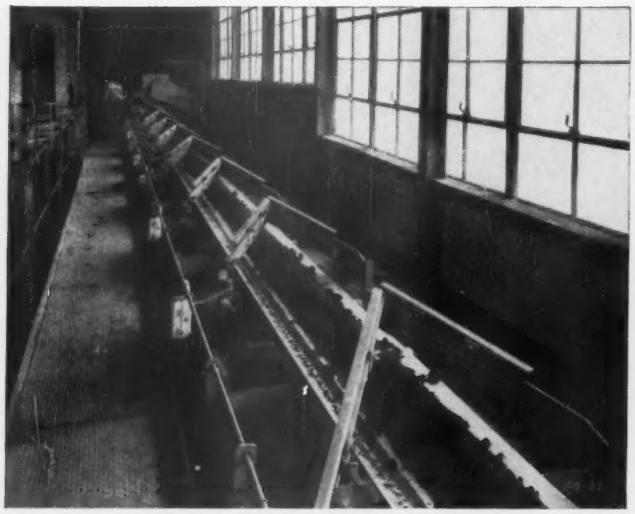
Birmingham • Chicago • Cleveland • Detroit • Houston
Los Angeles • Phillipsburg, N. J. • Pittsburgh • San Francisco

Circle 598 on Inquiry Card—Page 201

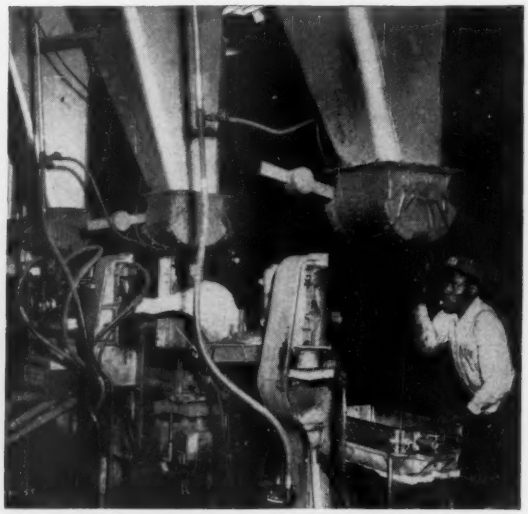
JEFFREY MECHANIZATION cuts costs

for handling and conditioning sand

at Forest City Foundries Company, Cleveland, Ohio



V-plows on overhead Jeffrey distributing belt conveyors, for diverting sand to molders' hoppers, are automatically air-operated. The two distributing conveyors and the cross conveyor move at 150 feet per minute; can handle 35 tons of sand per hour.



Ten Jeffrey hoppers along one side of the foundry, and nine along the other side, supply sand to the molders' stations. Hoppers are provided with 15" by 24" foundry-type clamshell valves.

Molds are poured on roller conveyors running between molding stations and shakeout conveyor. Poured molds are dumped onto this 65-foot Jeffrey vibrating conveyor, which shakes sand loose from the hot castings as they move along.

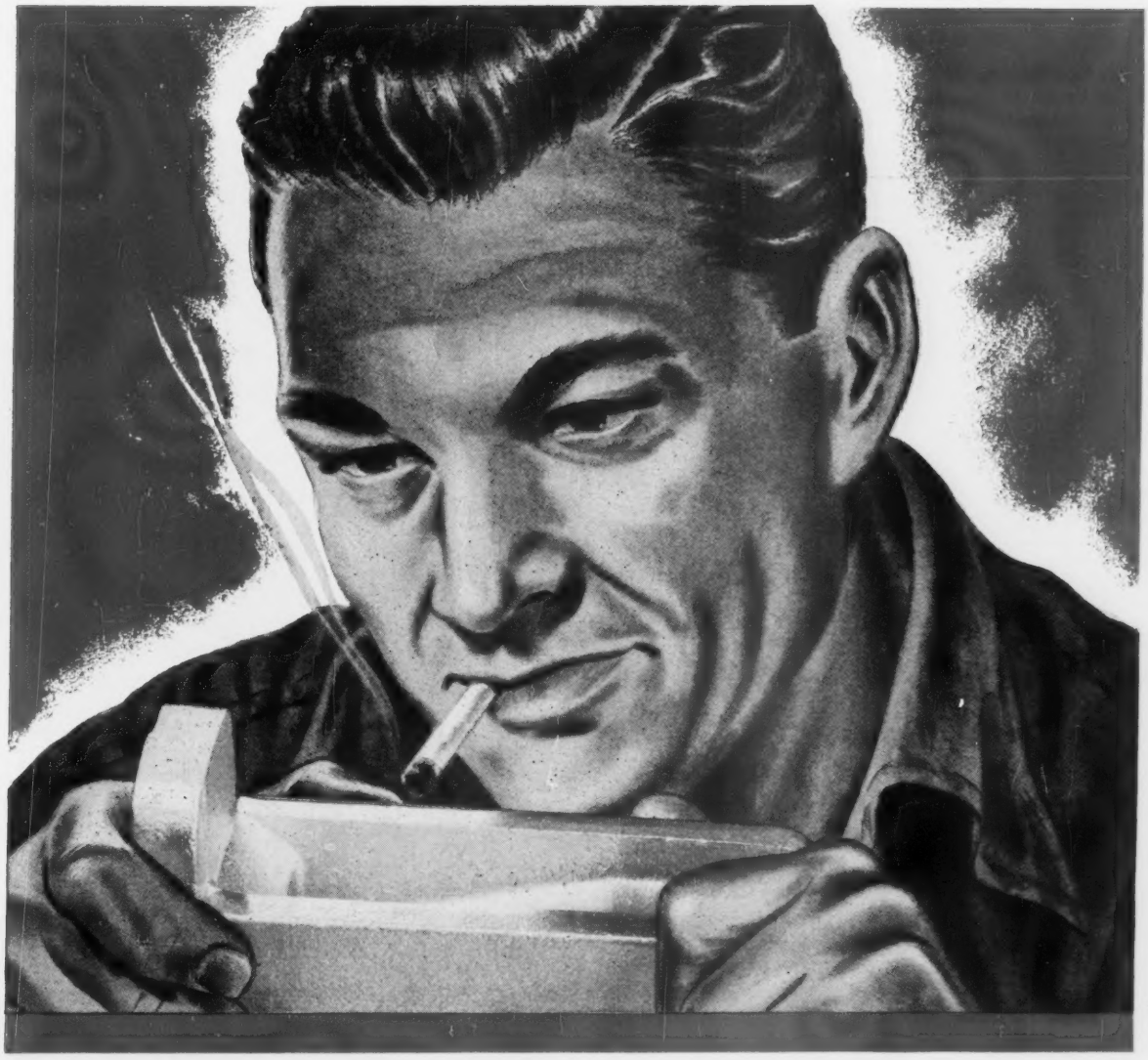
Castings and sand drop from this vibrating conveyor into the shakeout machine. Used sand is carried away by a Jeffrey apron conveyor, passed through cleaning and reconditioning equipment, after which it is elevated to storage by a Jeffrey bucket elevator. Now it's ready to start the circuit again.

Jeffrey can mechanize a complete foundry or a single operation. Write for Catalog 845. The Jeffrey Manufacturing Co., Columbus 16, Ohio.

JEFFREY

CONVEYING • PROCESSING • MINING EQUIPMENT
TRANSMISSION MACHINERY • CONTRACT MANUFACTURING

Circle 599 on Inquiry Card—Page 201



He has to see for himself!

When it comes to blast cleaning, a foundryman can't believe claims and promises. He has to see for himself the kind of cleaning job an abrasive does. His next question is: What does it cost in operation? Different jobs may require different abrasives but the result should always be the same—the *best* job at *lowest cost.* Malleabrasive and Tru-Steel abrasives give you that. Whichever you need, Pangborn has the right abrasive for your job. Talk to one of our sales engineers or write PANGBORN CORP., 1400 Pangborn Blvd., Hagerstown, Maryland.

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TRU-STEEL SHOT

3A

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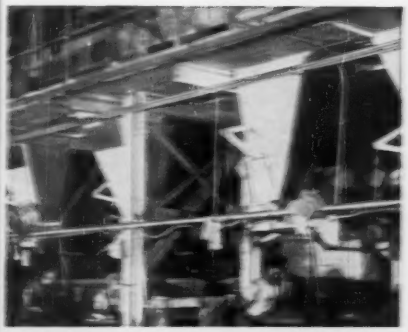
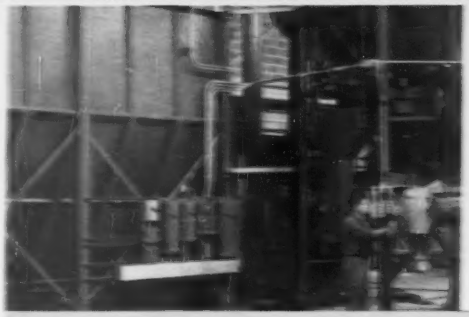
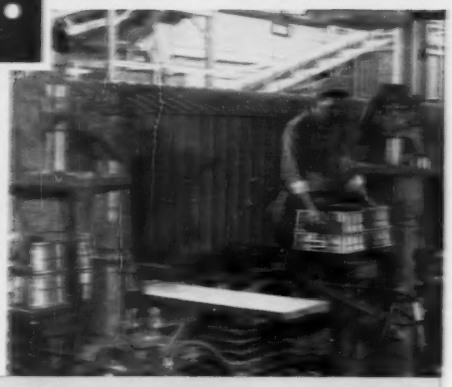
HUNDREDS OF FOUNDRIES CALL ON EXPERIENCED KNIGHT ENGINEERS FOR PRACTICAL, RELIABLE ASSISTANCE...







...ON VIRTUALLY ALL FOUNDRY PROBLEMS!

The key men in Lester B. Knight & Associates, Inc. have from 10 to 30 years successful experience in some phase of foundry management, production, engineering or equipment. The coordination of each man's specialized experience has enabled the Knight organization to complete hundreds of successful assignments in every type of foundry—gray iron, steel, malleable, brass and bronze, magnesium, and aluminum. These foundries are producing castings from a few ounces to 50 tons, and from 1 to more than 1,500 tons of castings per day. Green sand, dry sand, cement, plaster, "shell" molds, permanent mold, centrifugal, die casting and investment casting operations all have been served by Knight.

Working closely with clients' staffs, Knight Engineers have assisted its clients to audit operations, define management functions, establish organization, modernize methods and facilities, and design complete new plants. They have successfully applied automation in varying degrees to a number of different types of foundries, and have assisted management to establish more economical procedures for the control of operations and costs.

Your operation can benefit by this comprehensive experience. A letter will bring a call from a Knight representative at your convenience.

Write for Knight Bulletin No. 101, "Professional Foundry Engineering."

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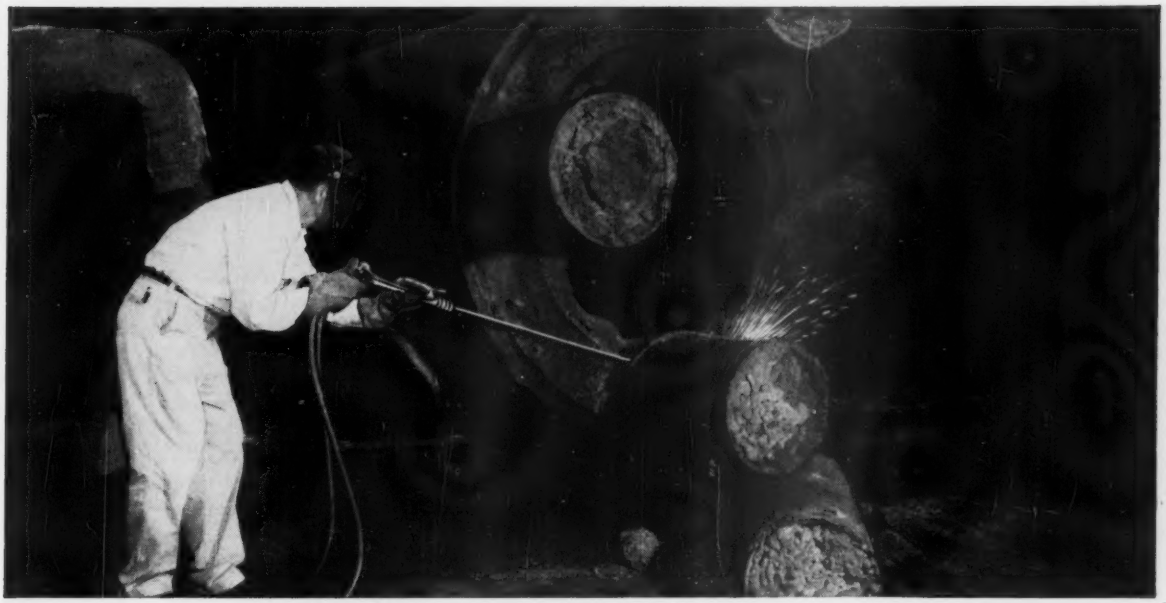
Circle 601 on Inquiry Card—Page 201

From 5 days to only 4 hours...



Powder-lancing is the fastest method for piercing steel and many other materials.

Using a powder-lance, it took one man only 12 hours to make a 3 ft. diameter hole in this 2 ft. thick slag pit wall.

Powder-lancing speeds steel mill operations

Once it took 2 men 5 days to chip away four 10 in. diameter risers on ingot molds like the one shown here—but these four risers were removed in only 4 hrs. using a powder-lance.... The removal of 6 in. diameter risers from another mold was speeded from 3 days to only 30 minutes.

In still another operation, a 3 ft. diameter hole was cut through the 2 ft. thick concrete wall of a blast furnace slag pit in only 12 hours. Cost savings were more than 50 per cent over previous methods.

Powder-lancing is the fastest method for piercing holes in concrete, cinder block, fire brick, blast furnace refractories, steel and cast iron containing inclusions, and sand and metal incrustations.

Cut costs, and speed production and maintenance in your mill . . . Call your local LINDE representative for more information on efficient, high speed powder-lancing. Start saving now, call him today.

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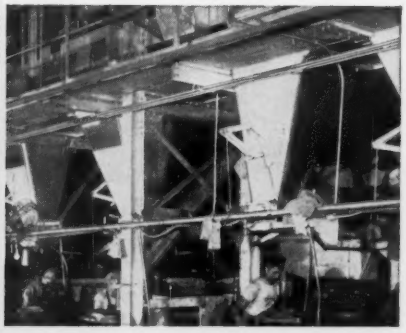
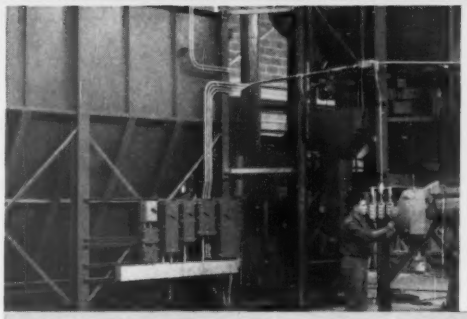
Crane Company
Chicago, Ill.
Dalton Foundries, Inc.
Warsaw, Indiana
Electric Steel Foundry Company
Portland, Ore.
Erie Malleable Iron Company
Erie, Pa.
Fahralloy Limited
Orillia, Ont.
Fairbanks, Morse & Company
Kansas City, Kan.
Ft. Pitt Steel Castings Division
McKeesport, Pa.
Hammond Brass Works
Hammond, Ind.
Haynes Stellite Company
Kokomo, Ind.
Macfarlane
Sagua la Grande, Cuba
Moline Malleable Iron Company
St. Charles, Ill.
National Roll & Steel Foundry
Avonmore, Pa.
Pittsburg Steel Foundry Corporation
Glassport, Pa.
Sulzer Bros. Ltd.
Winterthur, Switzerland
Unitcast Corporation, Ltd.
Sherbrooke, Quebec
Universal Castings Corporation
Chicago, Ill.
Wagner Malleable Iron Company
Decatur, Ill.
Woodruff & Edwards, Inc.
Elgin, Ill.
Worthington Corporation
Harrison, N. J.

HUNDREDS OF FOUNDRIES CALL ON EXPERIENCED KNIGHT ENGINEERS FOR PRACTICAL, RELIABLE ASSISTANCE...





...ON VIRTUALLY ALL FOUNDRY PROBLEMS!

The key men in Lester B. Knight & Associates, Inc. have from 10 to 30 years successful experience in some phase of foundry management, production, engineering or equipment. The coordination of each man's specialized experience has enabled the Knight organization to complete hundreds of successful assignments in every type of foundry—grey iron, steel, malleable, brass and bronze, magnesium, and aluminum. These foundries are producing castings from a few ounces to 50 tons, and from 1 to more than 1,500 tons of castings per day. Green sand, dry sand, cement, plaster, "shell" molds, permanent mold, centrifugal, die casting and investment casting operations all have been served by Knight.

Working closely with clients' staffs, Knight Engineers have assisted its clients to audit operations, define management functions, establish organization, modernize methods and facilities, and design complete new plants. They have successfully applied automation in varying degrees to a number of different types of foundries, and have assisted management to establish more economical procedures for the control of operations and costs.

Your operation can benefit by this comprehensive experience. A letter will bring a call from a Knight representative at your convenience.

Write for Knight Bulletin No. 101, "Professional Foundry Engineering."

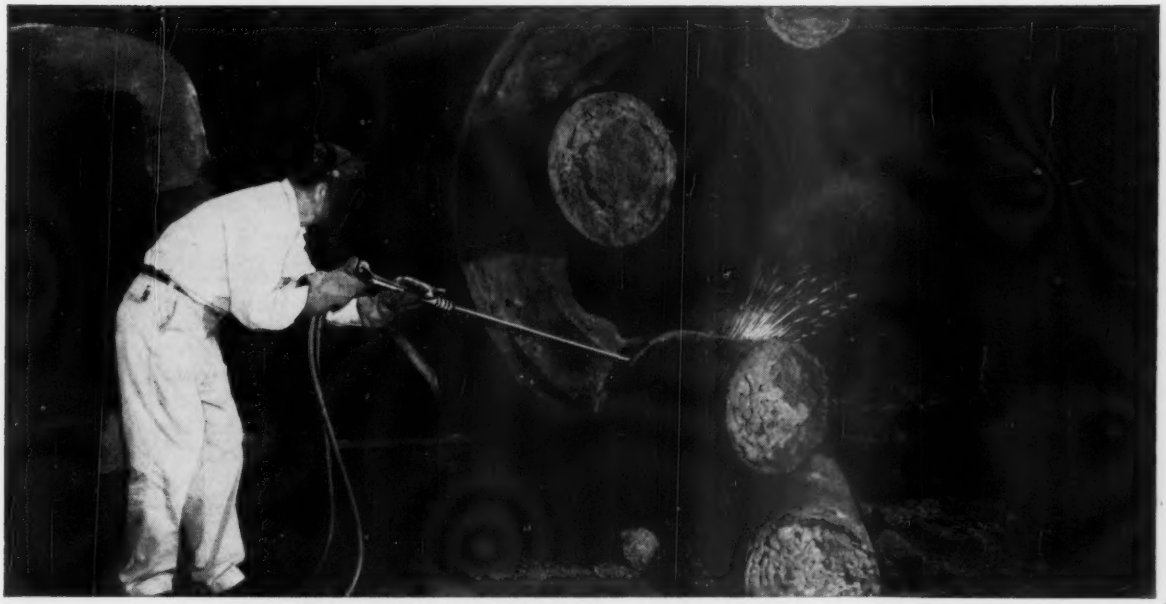
EVIDENCE OF EXPERIENCE

Lester B. Knight & Associates, Inc.

Management, Industrial and Architectural Engineers
MEMBER OF THE ASSOCIATION OF CONSULTING MANAGEMENT ENGINEERS, INC.
549 W. Randolph St., Chicago 6, Ill.
917 Fifteenth St., N.W., Washington, D.C.
New York Office—Lester B. Knight & Associates, 375 Fifth Ave., New York City 16

Circle 601 on Inquiry Card—Page 201

From 5 days to only 4 hours...



Powder-lancing is the fastest method for piercing steel and many other materials.

Using a powder-lance, it took one man only 12 hours to make a 3 ft. diameter hole in this 2 ft. thick slag pit wall.

Powder-lancing speeds steel mill operations

Once it took 2 men 5 days to chip away four 10 in. diameter risers on ingot molds like the one shown here—but these four risers were removed in only 4 hrs. using a powder-lance. . . . The removal of 6 in. diameter risers from another mold was speeded from 3 days to only 30 minutes.

In still another operation, a 3 ft. diameter hole was cut through the 2 ft. thick concrete wall of a blast furnace slag pit in only 12 hours. Cost savings were more than 50 per cent over previous methods.

Powder-lancing is the fastest method for piercing holes in concrete, cinder block, fire brick, blast furnace refractories, steel and cast iron containing inclusions, and sand and metal incrustations.

Cut costs, and speed production and maintenance in your mill . . . Call your local LINDE representative for more information on efficient, high speed powder-lancing. Start saving now, call him today.

Linde Air Products Company
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.
Offices in Other Principal Cities
In Canada: LINDE AIR PRODUCTS COMPANY
Division of Union Carbide Canada Limited, Toronto
(formerly Dominion Oxygen Company)

Linde
Trade-Mark

The term "Linde" is a registered trade-mark of Union Carbide and Carbon Corporation.

Now, RCI offers a cold setting core binder

New FOUNDREZ 7200 eliminates many production headaches, even with the largest cores!

RCI, working with foundry experts at the company's Swiss affiliate, has now developed a cold setting organic core binder, known as OL-COROVIT. You can order it as FOUNDREZ 7200.

FOUNDREZ 7200 solidifies in the core box at room temperature. This means you can handle even the largest cores routinely. In addition, an easily controlled accelerator gives short setting times, and lets you regulate setting time to your production requirements. FOUNDREZ 7200 not only makes green strength unimportant, but also eliminates core distortion during baking.

Baking time required for cores bonded with FOUNDREZ 7200 runs half or less than half that required when you use conventional binders.

Physical Properties of FOUNDREZ 7200

FOUNDREZ 7200 consists of:

1. A specially modified drying oil with these properties:

Average Viscosity	Z_2-Z_4
Non-Volatile	100%
Lbs./Gal.	7.85
Color	Dark

2. FOUNDREZ 7200-A accelerator

This new RCI core binder can be stored indefinitely in closed, well-filled containers. Also important to production, FOUNDREZ 7200 binder is *absolutely non-toxic*. It causes no reaction on the skin, even after long contact.

Extra Advantages with FOUNDREZ 7200

1. **Air-drying of sand** is all that's needed when you use FOUNDREZ 7200 core binder.
2. **Excellent flow properties** of FOUNDREZ 7200 sand mixes mean you can cut down sharply on the amount of ramming when you fill a core box.
3. **Fewer core arbors and rods** are needed when you use FOUNDREZ 7200 binder.
4. **No bedding sand or dryers** are required during baking of cores.
5. **Almost no gas or smoke** is emitted on pouring.
6. **Easy shake-out** is achieved every time, because FOUNDREZ 7200 burns away readily.
7. **Less time and labor** are needed. You cut the work involved in making large cores to about 20% of that required with conventional core mixes when you use the new FOUNDREZ 7200.

Write for full information. If you would like to know the procedure and typical formulations for better core binding with RCI's new FOUNDREZ 7200, write today for *Technical Bulletin F-11*.

Creative Chemistry... Your Partner in Progress

REICHHOLD

Synthetic Resins • Chemical Colors • Industrial Adhesives • Plasticizers
Phenol • Formaldehyde • Glycerine • Phthalic Anhydride • Maleic Anhydride
Sodium Sulfite • Pentaerythritol • Pentachlorophenol • Sulfuric Acid

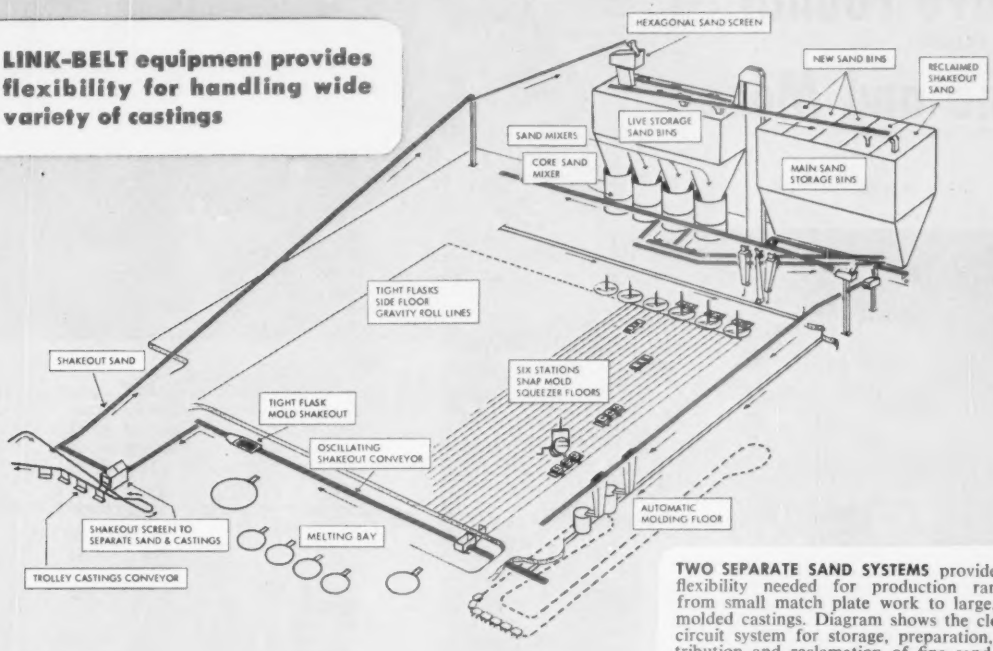
REICHHOLD CHEMICALS, INC., RCI BUILDING, WHITE PLAINS, N. Y.

Circle 603 on Inquiry Card—Page 201

General Metals jobbing foundry approaches

full mechanization

LINK-BELT equipment provides flexibility for handling wide variety of castings

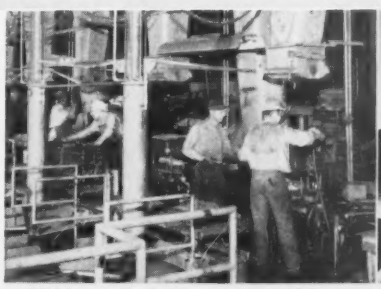


LINK-BELT

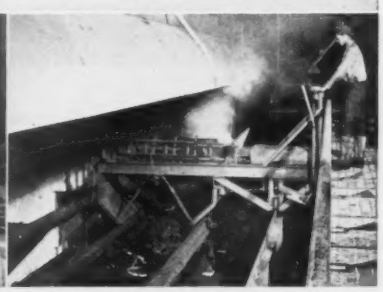
TWO SEPARATE SAND SYSTEMS provide the flexibility needed for production ranging from small match plate work to large, pit-molded castings. Diagram shows the closed-circuit system for storage, preparation, distribution and reclamation of fine sand and for light- and medium-weight castings.

THE variety of castings produced by job shops multiplies handling problems. But the Oakland (Calif.) plant of General Metals Corp. proves that mechanization is both possible and practical. Here Link-Belt equipment—including special machinery designed specifically for this installation—speeds production of castings ranging from one pound to seven tons. Other benefits include minimized manual handling, improved working conditions.

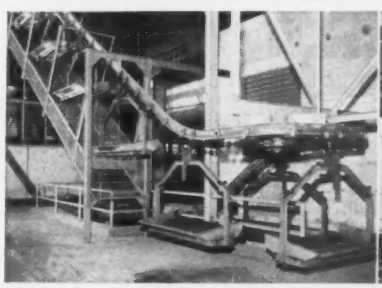
Link-Belt engineers can plan an entire conveying and sand preparation system for you . . . and follow through with a complete line of equipment to help you produce better castings at lower cost. For one machine or complete engineering, call your nearest Link-Belt office. For complete information, write for Book 2423. 14,207



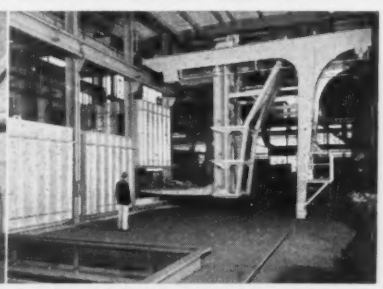
Molds are loaded onto cars, which are rotated 90 degrees on turntable and run off on tracks to pouring and storage line.



Semi-automatic device dumps sand and castings onto oscillating conveyor. Cars return by gravity to molding stations.



Castings drop from shakeout screen to trays of overhead trolley conveyor for delivery to cleaning bay.



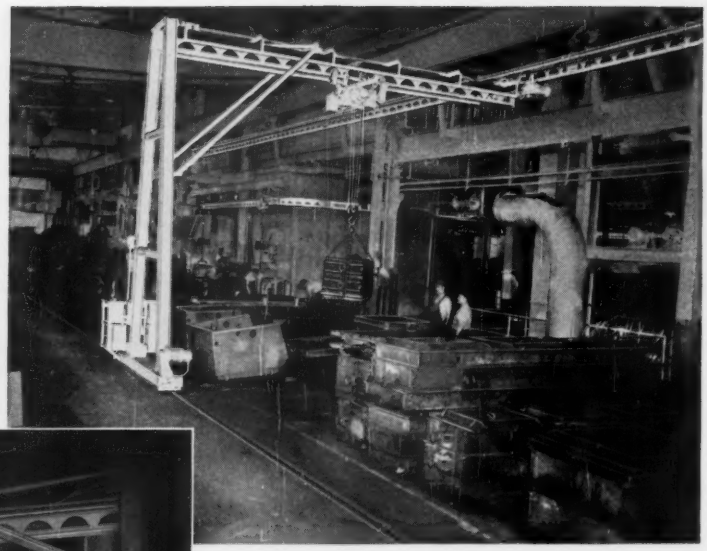
Unique Link-Belt "Manipulator" carries up to eight tons of castings to annealing ovens, quench tanks or storage.

LINK-BELT

CONVEYORS AND PREPARATION MACHINERY

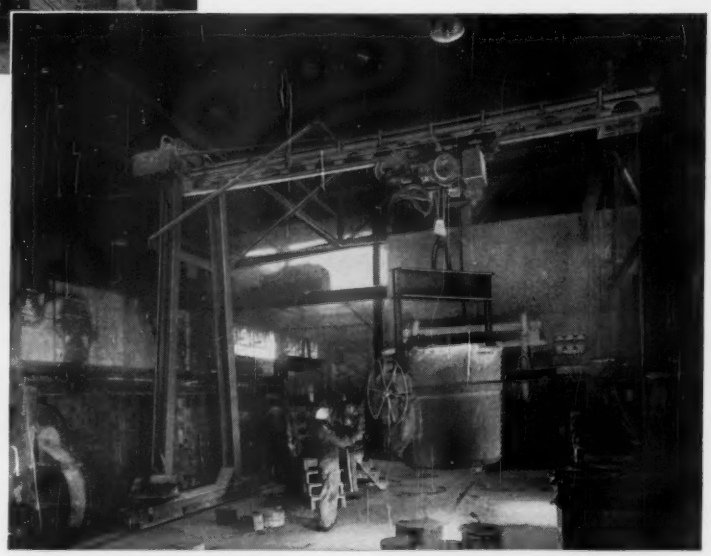
LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants and Sales Offices in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World.

Gantry Cranes Save Foundries Time and Money



This completely motorized Tramrail gantry crane handles molds to the shakeout. It works under heavy overhead cranes which are free to travel over it without interference.

3-ton gantry crane in core storage section. One of four gantries on the same runway operating under an overhead traveling crane, providing handling service for local areas.



5-ton completely motorized gantry crane in a ladle repair room. The gantry makes it an easy job to move ladles around as desired for relining and necessary repairs.

BECAUSE Cleveland Tramrail gantry cranes are easily installed to operate under other cranes or overhead materials handling systems, many foundries have found them very valuable. They provide additional materials handling service so often needed for local or spot handling in various areas without interference with existing top-running cranes.

Much time lost by workers waiting for crane service is saved when gantry cranes are provided. Because they are relatively inexpensive, several can usually be purchased for less than the price of a standard overhead crane.

WRITE FOR FREE COPY of Engineering and Data Booklet No. 2008. Packed with helpful information

CLEVELAND TRAMRAIL

Overhead Materials Handling Equipment

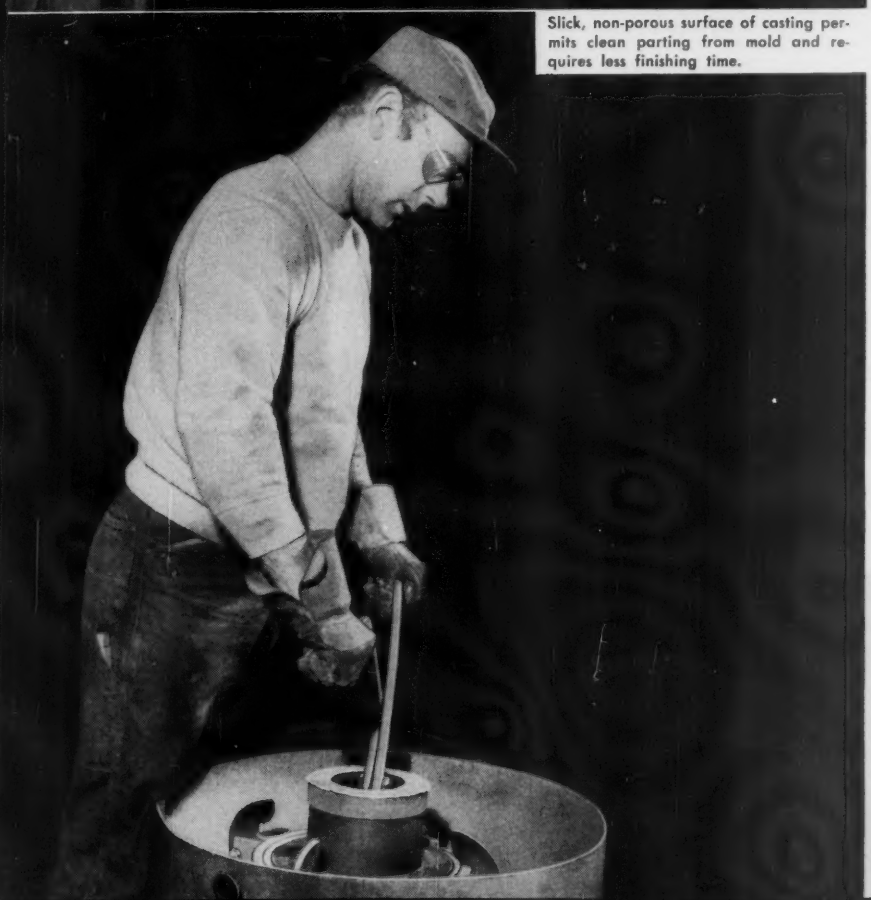
CLEVELAND TRAMRAIL DIVISION • THE CLEVELAND CRANE & ENGINEERING CO. • 3842 E. 286 ST. • WICKLIFFE, OHIO

Circle 605 on Inquiry Card—Page 201

Circle 606 on Inquiry Card→

'dag' dispersions... *a touch does so much!*

After mold is machined, undiluted 'Prodag' is rubbed on the inside with a cloth.



Slick, non-porous surface of casting permits clean parting from mold and requires less finishing time.

"Mold treatment with 'Prodag' for better products at low cost."

says Wisconsin Centrifugal Foundry

Wisconsin Centrifugal Foundry casts sleeve-type brass bearings in graphite molds. Castings range from 2 inches to 30 inches in diameter; pouring temperatures from 2,000 to 2,200°F. This company has found that a single application of undiluted **'Prodag'**, rubbed into the mold, lasts for entire production runs of certain items. Molten metal does not adhere to the inside surface, so castings part easily. Less time is required for finishing, so rejects are fewer. **'Prodag'** helps Wisconsin Centrifugal turn out a better product at a lower cost.

'Prodag' and other Acheson dispersions have become indispensable for many foundry applications because of their remarkable properties under the most severe conditions. Acheson Service Engineers will be glad to give you specific information on the use of **'dag'** dispersions for mold coatings, maintenance lubrication, and other applications. No obligation, of course.

For ready-to-use materials containing 'dag' dispersions see your own oil supplier, or write directly to us.

ACHESON COLLOIDS COMPANY

PORT HURON, MICHIGAN

. . . also Acheson Colloids Ltd., London, England

ACHESON COLLOIDAL DISPERSIONS:
Graphite • Molybdenum Disulfide • Zinc Oxide
Mica and other solids

'dag' and 'Prodag' are registered trademarks of Acheson Industries, Inc.

Offices in: **Boston • Chicago • Cleveland • Dayton**
Detroit • Los Angeles • Milwaukee • Philadelphia
New York • Pittsburgh • Rochester • St. Louis • Toronto

Acheson Colloids Company
Port Huron, Michigan, Dept. J-1

Yes, I want your free bulletin No. 425 describing 'dag' Dispersions in Metal Casting.

Name_____

Title_____

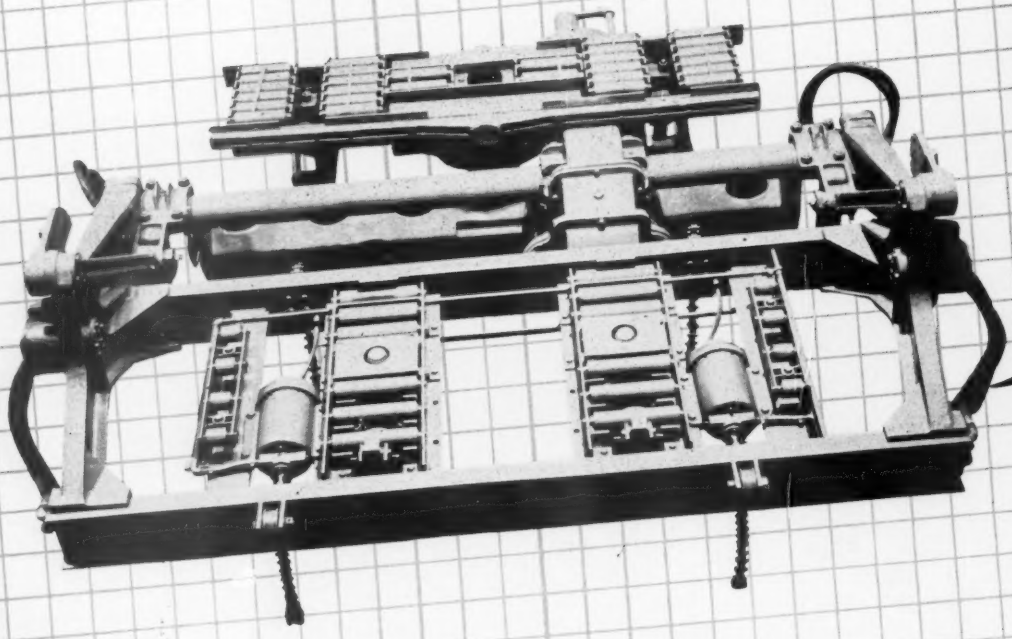
Company_____

Address_____

City_____ Zone____ State_____

HERMAN

Charging Conveyor Machine



IDEAL for short-run work

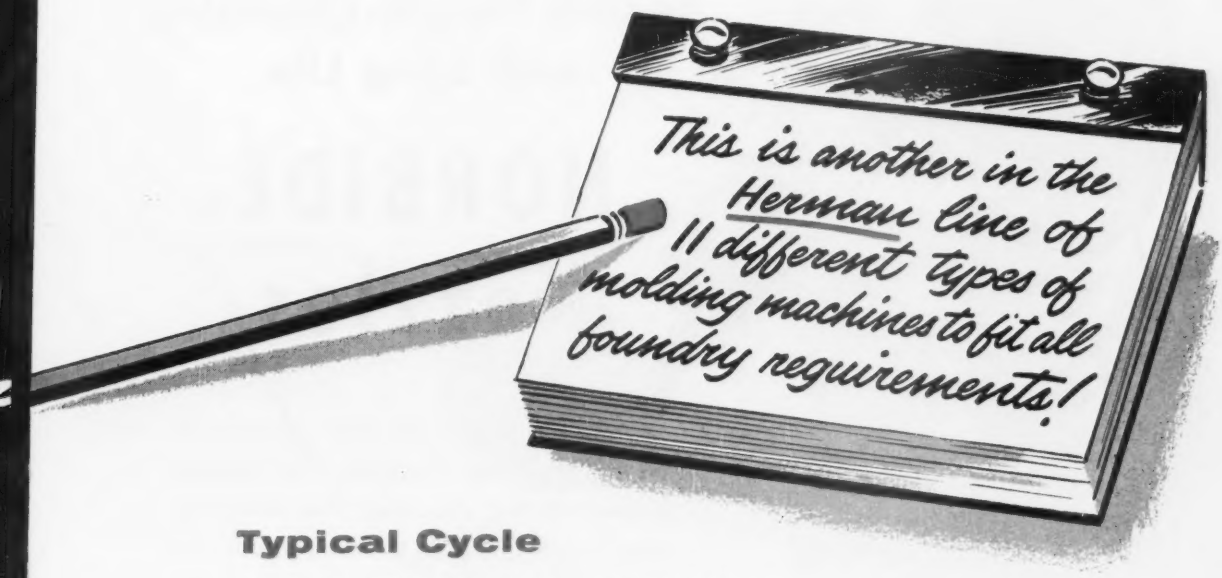
HERMAN PNEUMATIC MACHINE CO., UNION BANK BUILDING, PITTSBURGH 22, PA.

If your type of work calls for short runs, the Herman Charging Conveyor Rollover and Draw Machine is the modern, economical answer.

Its extreme flexibility, *on either cores or molds*, makes it possible to produce a tremendous range of sizes and types of work.

This comparatively new machine in the HERMAN line is already being widely used in the foundry industry. Foundrymen choose it because it's versatile and operates equally well with either a Jolt Machine or Sandslinger.

It is produced in our broad range from 500 to 20,000 lb. rollover capacities.



Typical Cycle

1. Core box filled with sand and placed on the jolt unit.
2. Power lift conveyor lowers box on sub-plate.
3. Core box is jarred and elevated by power lift conveyor to standard conveyor level.
4. Box goes to Charging Conveyor Rollover and Draw Machine, manually or by pusher mechanism.
5. Pneumatic core box and core plate clamps engage rammed core box for rollover operation.
6. After rollover, core clamps are disengaged and slow draw operation starts.
7. Vibrators separate bond between core box and sand.
8. Fast draw operation checked by speed control device and core box gently deposited directly on discharge conveyor and rolled away on companion conveyor.
9. Inverted turnover plate and core box rolled back to upright position, pneumatic clamps disengaged and box returned to either jolt station or storage.
10. Another rammed core box should, of course, now be at the Charging Conveyor Rollover and Draw Machine for the production of another core.

Why don't you get in touch with us right now for more information. Write for our catalog No. GC-11-53.

HERMAN

Best Known Name in Molding Machines

Circle 607 on Inquiry Card—Page 201

Ready to Blast!

Reduce Nozzle Changing with Long Life

NORBIDE® Nozzles

These rugged nozzles — lined with NORBIDE Boron Carbide, the hardest manufactured material commercially available—maintain stream contour and last hundreds of hours longer than any other nozzle made, eliminating expensive nozzle changing.

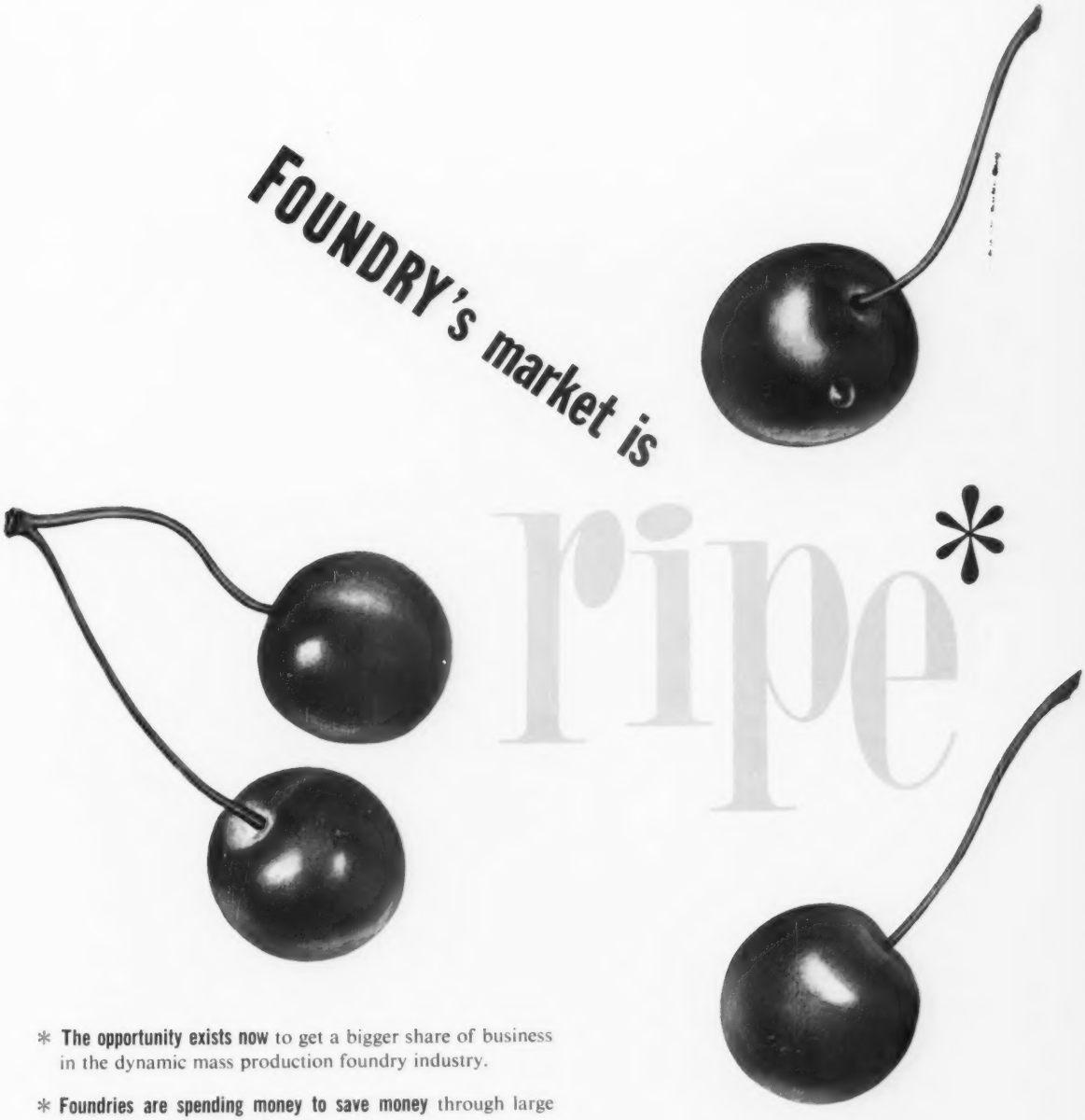
Available in a variety of sizes and styles. Try 'em on your toughest blasting jobs. For full details, write for your free copy of Form 543.

NORTON COMPANY
43 New Bond Street, Worcester 6, Mass.

NORTON
BORON CARBIDE

NORBIDE® ... *The Longest Nozzle Life You Can Buy*

FOUNDRY's market is ripe*



* **The opportunity exists now** to get a bigger share of business in the dynamic mass production foundry industry.

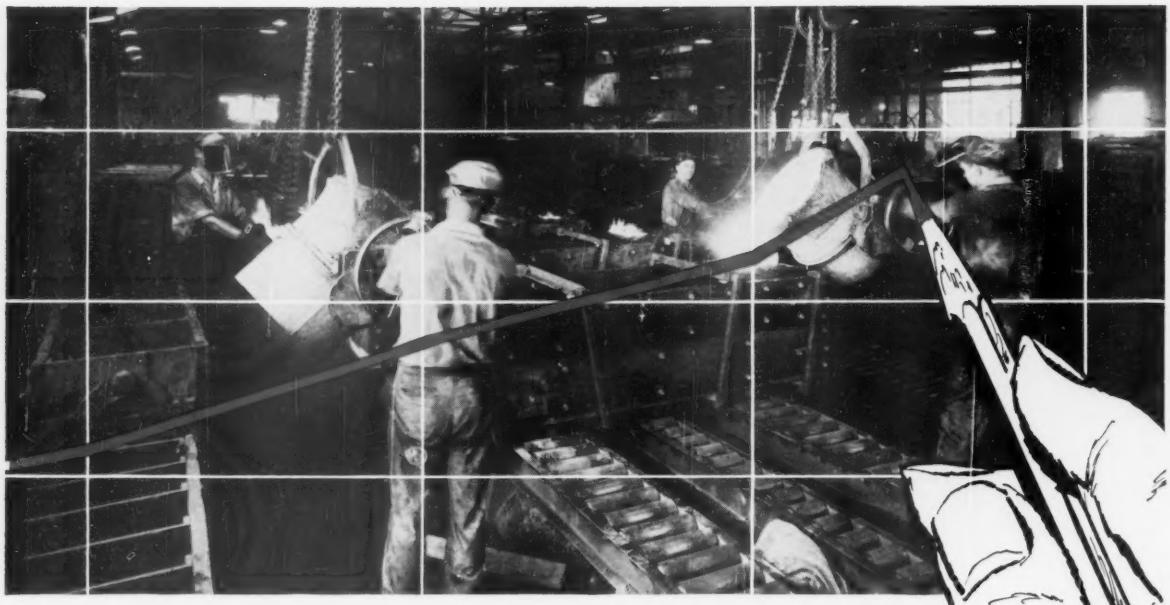
* **Foundries are spending money to save money** through large scale mechanization and modernization.

* **66,000 key buying influences await your product story in FOUNDRY** . . . the publication more foundrymen say is "most useful".

* **Inject new life into your entire foundry selling effort** with FOUNDRY's complete Sales Development Service. Ask us for more details.

You do more business with foundries when you advertise in FOUNDRY!

a PENTON Publication / Penton Building, Cleveland 13, Ohio



HOW DOES YOUR FOUNDRY GROW?

Through an increasing awareness of cast metals potential; through streamlined production methods; through continued research and new development.

Yes, these are the necessary growth factors. But they all stem from one source . . . sound, technical leaders and pre-indoctrinated customers.

The investment of the foundry industry in the student of today and tomorrow largely determines its potential. We cannot grow as an industry — or as an individual foundry — without soundly indoctrinated foundry technicians.

Through the efforts of the Foundry Educational Foundation, 31% of all engineering students at F.E.F. affiliated universities now participate in cast metals study. This means a large annual pool of capable producers for the foundry industry.

What are you contributing to that pool today, for your greater benefit tomorrow?

● *Write today for our detailed booklet, "Let's Look Ahead".*

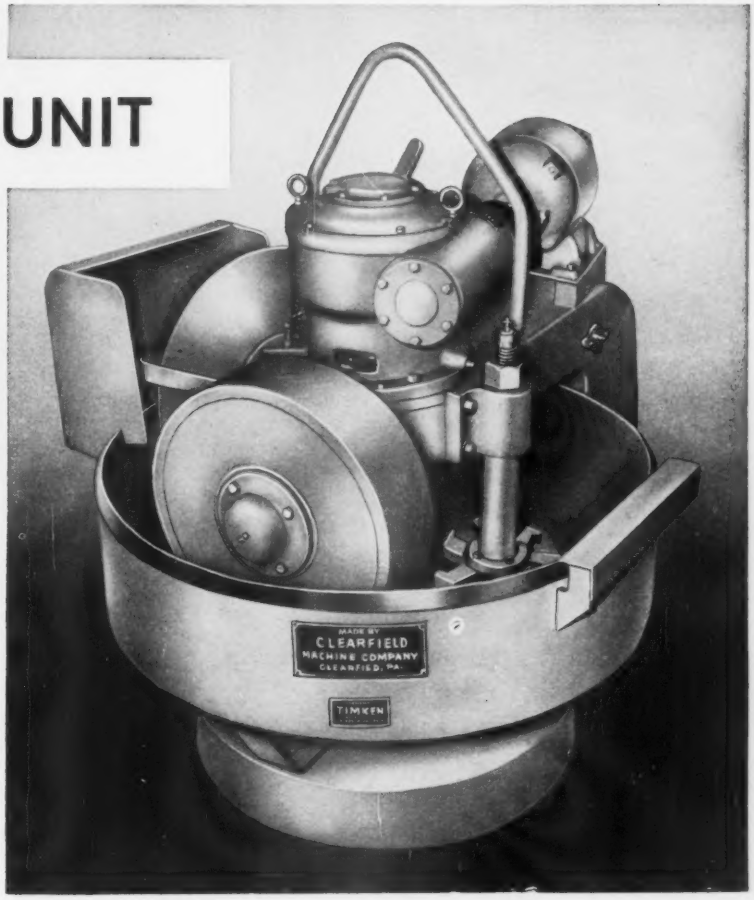
Foundry Educational Foundation

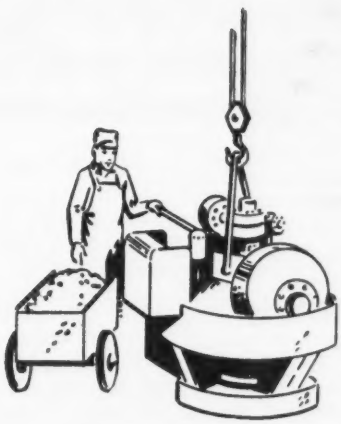
1138 TERMINAL TOWER BUILDING • CLEVELAND 13, OHIO

The Foundry Educational Foundation does not pay for this advertising. This space has been contributed by FOUNDRY magazine in support of FEF's constructive program for foundry industry progress through education.

ONE MIXING UNIT for all sand preparing purposes

the CLEARFIELD No. 414





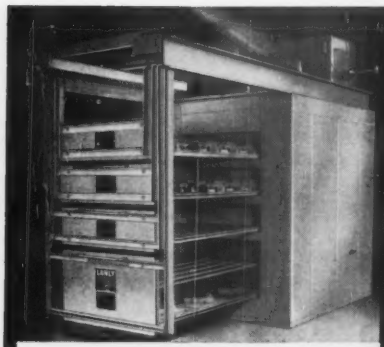
CLEARFIELD MIXER
the choice of
industrial leaders

Being small, compact and of low power consumption, the Clearfield No. 414 is ideal for plants where the sand preparation system is built around the portability of the mixing unit. When suspended from a crane or monorail hoist by means of a hook that is provided, the Clearfield Mixer may be carried over the entire molding area. The machine is perfectly balanced and may be loaded, operated and discharged while suspended above the floor. Mixes may be changed from one type to another as often as necessary without contaminating the succeeding charges. If crane facilities are not available, or if they are not desirable, the Clearfield can be equipped with roller bearing casters to retain the feature of portability.

For more information on portable mixers, write today for our Catalog No. 83

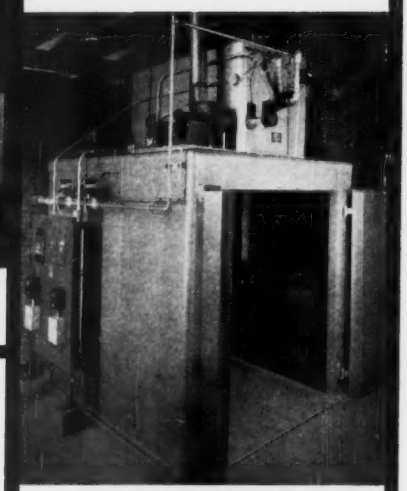
CLEARFIELD MACHINE COMPANY

CLEARFIELD, PENNSYLVANIA, U. S. A.



Drawer, . . .

. . . Rack, or



Car Type OVENS . . .

In your Foundry a

LANLY

Installation . . .

Will aid in . . .

Reducing Fuel Costs, Reducing Handling Costs, Improving Production Quality, Increasing Production

FASTER, BETTER and LESS COSTLY PRODUCTION . . . Time worn words to be sure, but what Foundry today would not welcome this in view of increasing competition, labor costs and more demands upon its facilities.

There is no better time than NOW to examine your production operations.

Check your ovens! Are they fuel eaters, heat losers or core spoilers? Ask the men who operate them!

Chances are you'll find unexpected revelations that will merit a phone call or letter to us.

We'll be pleased to discuss your problems without obligation.

WRITE FOR THE LATEST CATALOG AND FACTS ON ANY INSTALLATION

LANLY FOUNDRY OVENS

THE LANLY COMPANY • 780 PROSPECT AVE
CLEVELAND, OHIO

"People's lives depend on our castings," says Nick Odorisio

"And we depend on Cities Service Core Oil," continues this well-known foundryman at Kimball Brothers Company.

If you operate a foundry, there's a chance you've heard of Nick Odorisio. Now with Kimball Brothers Company of Council Bluffs, Iowa, Nick has devoted the last 45 years to the foundry business, guiding many a mid-west foundry to smoother operation.

"Here at Kimball Brothers," says Nick, "there's probably less room for error than in almost any other foundry operation . . . for we make freight and passenger elevators ranging up to 30,000 pounds capacity, and people's lives literally hang on the quality of our castings.

"Naturally, that requires perfect cores and perfect core oil . . . and that's why we rely on Cities Service Delco #36. I've been in the foundry business since I was 15 years old and tested a lot of core oil, but Cities Service Delco #36 gives more trouble-free performance than any other oil I've ever seen. The oil is uniform, prevents trouble with gas which could produce flaws, and allows practically no breakage of cores. I'd never hesitate to recommend Delco #36."

For more information about this unique core oil which Mr. Odorisio praises so highly, talk with a Cities Service Lubrication Engineer. Or write: Cities Service Oil Company, 20 North Wacker Drive, Chicago 6, Illinois.

Getting to the Core of the Situation. Kimball Brothers makes cores for elevator castings ranging from a few ounces to 1500 pounds. But there's almost never any breakage or flaws, thanks to Cities Service Delco #36 Core Oil.

Complicated Casting Made Without Complications is displayed by Assistant Foreman Richard Flowers. Like Nick Odorisio, he combines expert knowledge with extreme pride of craftsmanship and Kimball Brothers' castings reflect it.

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS

(Advertisement)

An Important Message to Foundry Executives

Competition and the Seven

The *Law of Diminishing Returns* is becoming a curse in foundries of all types. Chief cause is the greatly accelerated rate of obsolescence in molding machines . . . and *time* is the key factor.

Seven years is a *relative* increment of time. Its significance varies with the subject concerned. A child of seven is only a youngster, still fourteen years short of maturity. A dog is pushing the averages at seven. And a foundry molding machine that is seven years old or older . . . no matter how well it has been maintained . . . is *economically* obsolete.

Other types of machinery still are in their prime at age seven. Why is the molding machine an exception? The answer is simple. Its environment as well as its function are unfavorable to longevity.

The abrasive action of sand is an accepted evil in molding operations. Every foundry has experienced profit-cutting "replacement costs", even with the best equipment. What many foundry executives overlook, however, is the fact that *replacement parts do not make a new machine.* They can bring a machine back to its *own* standard, but they cannot compensate for new production techniques or for basic improvements in molding machine design.

Admittedly, it is cheaper . . . in the short run . . . to replace parts than to purchase new machines. But what are the long-range aspects of this practice? If

rebuilt equipment cannot match a competitor's new equipment in capacity or economy of operation, how can a foundry using old machines meet competitive price and delivery schedules and still show a reasonable profit? This is not a rhetorical question. It keeps many foundry executives awake nights.

Another cost-consuming factor with old machines is "Down-time" . . . the irreplaceable loss of production capacity. The older a machine is, the more maintenance it requires, the greater the periodic down-time. *Unfortunately, "overhead costs" never stop for replacement.*

Consider your foundry's situation for a moment. Can you meet or beat your major competitors' price, quality and delivery? If you can, you are most fortunate. But . . . let's suppose you *are* at a competitive disadvantage. How long can you stay in that position and survive?

In industry, as in war, there are "the quick" and "the dead". The former keep pace with industry trends and changes . . . know when and how to improve operations and maintain their favorable position. These aggressive men also follow the policy of continual investment in new equipment.

The "dead" try to stand still in a moving current. They practice short-range economies and philosophies. And eventually they drown in the steadily rising river of competition.

The foundry economy is in a dramatic state of flux. A major factor is the growth of *automation* . . . a science with exciting, almost magical, overtones but with an extremely practical foundation. Automation is the large company's answer to shrinking profits as well as to greater production capacity of uniform standard. It is not, however, economically feasible for the majority

(Advertisement)

Concerning . . .

Year Curse

of jobbing or production foundries. In most cases, automated operations involve a far-greater-than-average capital expenditure.

This message is directed therefore to foundrymen who want to achieve greater efficiency and profits at relatively low cost. The answer here also is simple. *Invest in new high-speed semi-automatic equipment.* Relegate your seven year old molding machines to odd jobs. Or put them on the used machinery market. (There still are many who cannot see the "wolf at the door".)

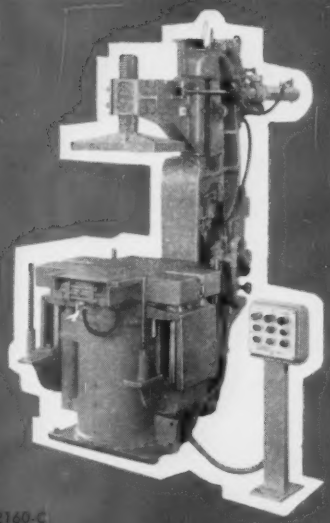
Once you have made this decision, select your new molding equipment carefully. But remember that old buying habits, like old machines, can cost you more in the long run.

EFFICIENT NEW EQUIPMENT GIVES YOU A COMPETITIVE ADVANTAGE IN PRICE, QUALITY, DELIVERY.

Your best bet is to select equipment made by the manufacturer who leads the industry in Creative Engineering . . . SPO Incorporated. Technological innovations developed by this company since World War II have had a profound effect on the foundry industry.

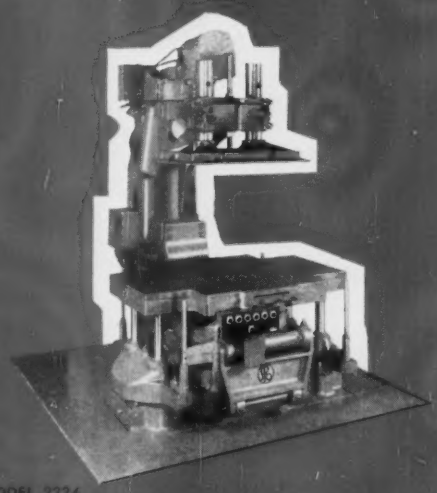
SPO "firsts" include development of the maintenance-free inverted jolt mechanism . . . the fully automatic SPOMATIC molding system and its components . . . the first practical hollow core machine . . . the self-aligning stripping mechanism . . . and the first successful application of green sand cores.

These accomplishments have established SPO as the leader in molding machine and ancillary equipment development. That is why SPO has become the world's largest supplier of molding machines, offering a complete range of types and sizes. SPO INCORPORATED, 6449 Grand Division Avenue, Cleveland 25, Ohio



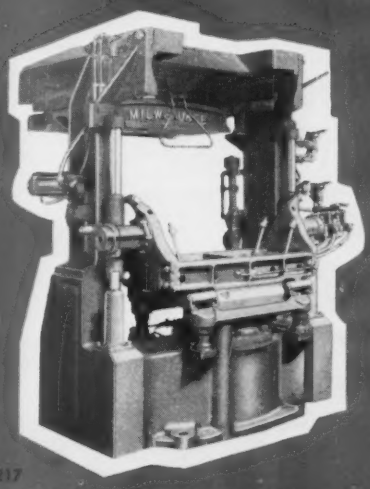
MODEL 2160-C

Series 2000-C *jolt-squeeze-strip/draw* machines feature automatic controls and simplified pushbutton operation. Available with squeeze cylinder diameters of 13, 14 and 16 inches.



MODEL 2224

Featuring patented "inverted jolt" mechanism, this semi-automatic Series 2000 *jolt-squeeze-strip* machine handles wide range of flask sizes. Seven models available with jolt capacities from 1500 to 4000 pounds.



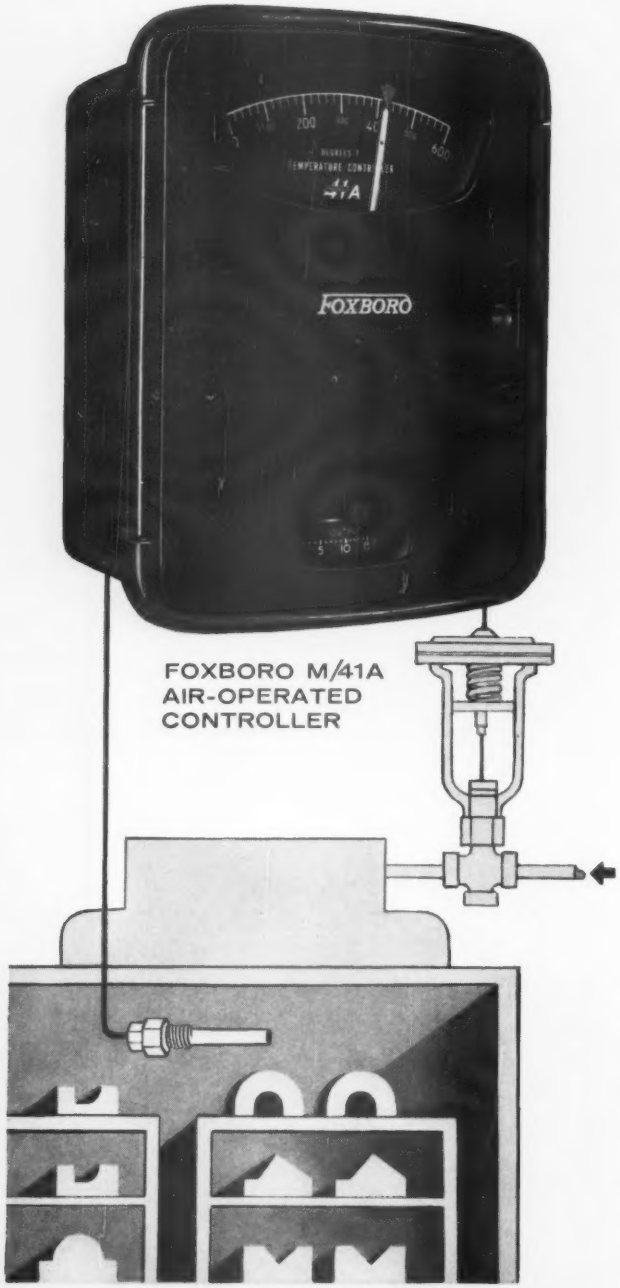
MODEL 217

This SPO-MILWAUKEE *jolt-squeeze-rollover-draw* machine combines all operations in simplest possible cycle for fast production of drag molds. Three models available (16, 21 and 30-inch squeeze pistons).

6902-SPI

WHY RISK CORE FAILURES?

... meet critical baking requirements precisely



FOXBORO M/41A
AIR-OPERATED
CONTROLLER

WITH FOXBORO M/41 CORE OVEN TEMPERATURE CONTROL

You can be sure that you are maintaining the critical baking temperatures which today's complex sand mixes require . . . when your core oven is equipped with the Foxboro M/41. There's no guesswork: This Controller's large indicating scale continuously shows "set" temperature and actual oven temperature . . . proves to the operator that cores are getting the specified bake *precisely*. And models are available for every type of heating system.

Both the M/41A (air-operated) and the M/41E (electric) sense the smallest changes in temperature . . . both respond with positive-power control action. Both are high-accuracy devices, built for years of dependable, trouble-free service.

Protect the quality of your core production with quality core oven control. Specify Foxboro M/41 Temperature Control (air-operated or electric-operated) on new equipment, or install easily and quickly on your present ovens. For detailed information, write **The Foxboro Company, 321 Neponset Ave., Foxboro, Mass.**

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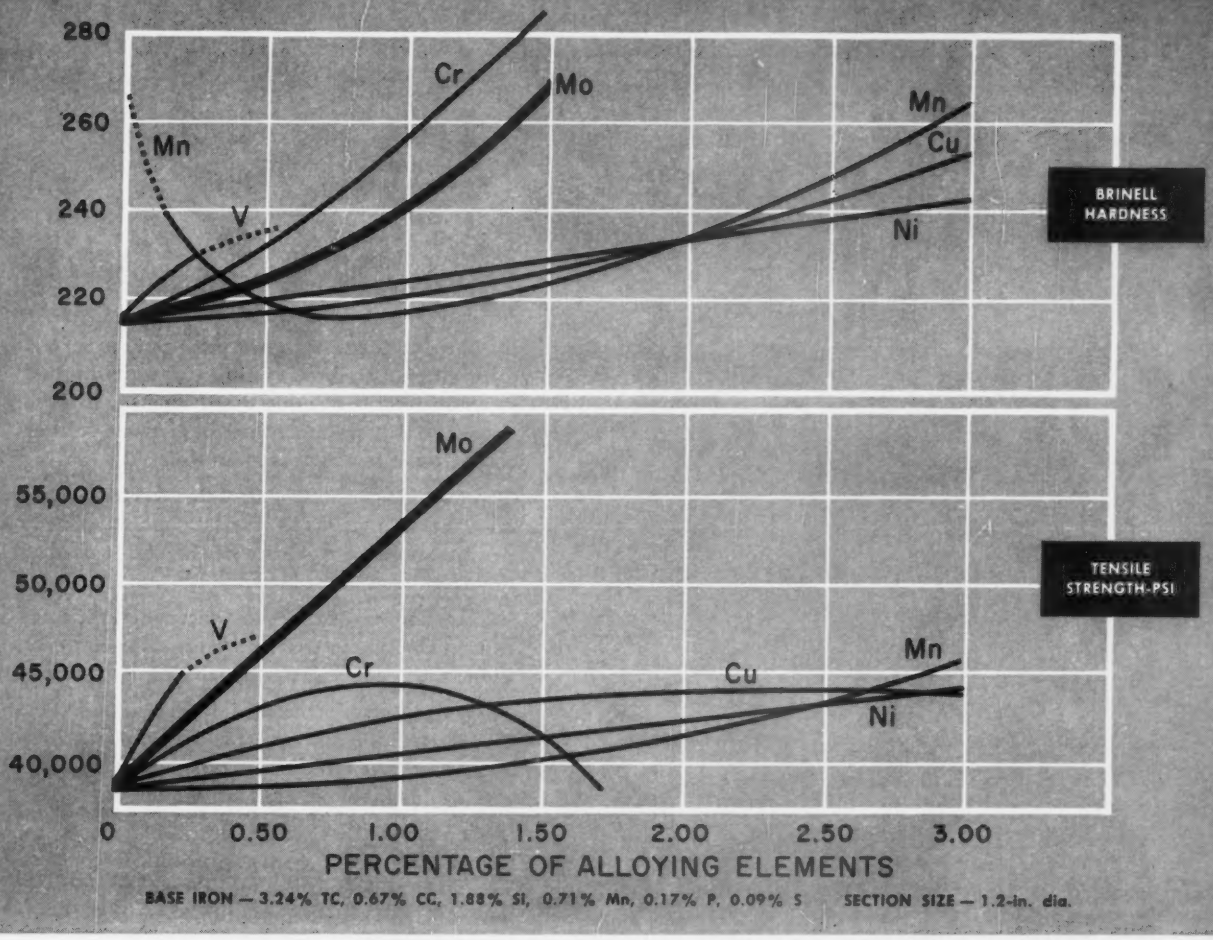
COMPLETE FOUNDRY INSTRUMENTATION



Note how additions of moly, up to 1.5%, produce proportional improvements in strength. And, with moly, hardness increases much more slowly. It means higher strengths can be used with less danger of impaired machinability.

each ½% Moly adds 7000 psi to strength of cast iron...

A little moly adds a lot of strength – for molybdenum increases strength more than any other common alloying element, with the exception of small vanadium additions. A rule of thumb is that fifty points of moly raise tensile strength 7000 psi. And without sacrificing toughness. Actually, moly improves toughness at least as much as strength.

What's more, versatile moly aids in obtaining uniform response to heat treatment . . . and in producing machinable, growth-resistant castings. Moly is easy to use, too.

With most grades of cast iron, moly requires no change in the character of the charge, normal melting practice, or the base metal. And foundrymen like the fact that the small additions necessary may be made at the spout or in the ladle.

Write now for "Why Moly Iron". It's the full story of how and why moly adds strength faster than hardness, how it increases fatigue and torsional strength—in short why moly makes better cast iron. Climax Molybdenum Co., Dept. 20, 500 Fifth Avenue, New York 36, N. Y.

CLIMAX MOLYBDENUM

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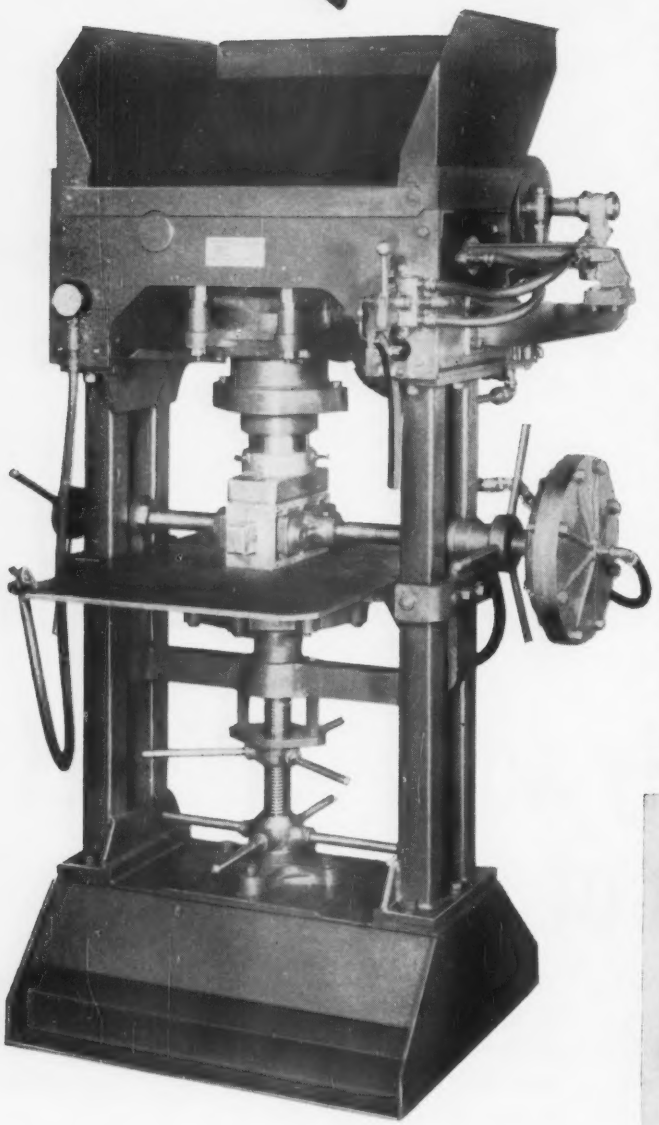
Redford NO. 4 CORE BLOWER



Designed to add more power, capacity, and speed to traditional Redford simplicity, flexibility and convenience, the No. 4 Redford superbly fills the need for a truly fast and flexible machine to blow cores from a few ounces to 10 lbs.

There is no need for the operator to wait for the machine at any time — the fast operating cycle permits immediate release of the core box after the cores have been blown.

Exhaust air is utilized to thoroughly fluff the sand remaining in the sand magazine after each blow, thus reducing the possibility of cratering.

Magazine heads normally furnished with the No. 2 Redford machine can be used with the No. 4 Redford. Larger new type magazine heads are also available as standard equipment.

A completely new fully adjustable clamp for vertically parted core boxes simplifies core box set up — when not needed the clamp units can be adjusted all the way out or completely taken off the machine.

Redford No. 4 users report production up to 8 boxes per minute using only one core box per machine. To get complete information write for Specification Bulletin 4.

Cores at right illustrate wide range of work that can be done with the Redford No. 4 Core Blower.

Redford IRON & EQUIPMENT CO.

20733 GLENDALE AVENUE • DETROIT 23, MICHIGAN • PHONE: KENWOOD 1-8611

you can really
do sand tricks
with plasti-bond
. . . yet (like the props in any trick) it's not hard to handle. You can combine high strength and toughness with flowability.
You can get maximum flowability, superior finish and easy control *plus* high strengths for easy molding, tough sand for deep pockets, low moisture for minimum defects. Sound like magic? You can get properties in sand such as you never got B.P.B. (Before *Plasti-Bond*). Read on.
Plasti-Bond gives you sand flexibility and versatility that will speed foundry operations, cut costs, improve castings and boost profits.
Not even *Plasti-Bond* can do the impossible but it comes so close to doing it, your curiosity, if not your troublesome sand problems, may lead you to get more information.
FREE—Just write for new brochure
"Sand Magic with Plasti-Bond"
EASTERN CLAY PRODUCTS DEPT.
INTERNATIONAL MINERALS & CHEMICAL CORPORATION
20 NORTH WACKER DRIVE • CHICAGO 6
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MINERALS International CHEMICALS
SAND MAGIC

if it's SAVINGS

here's further proof that

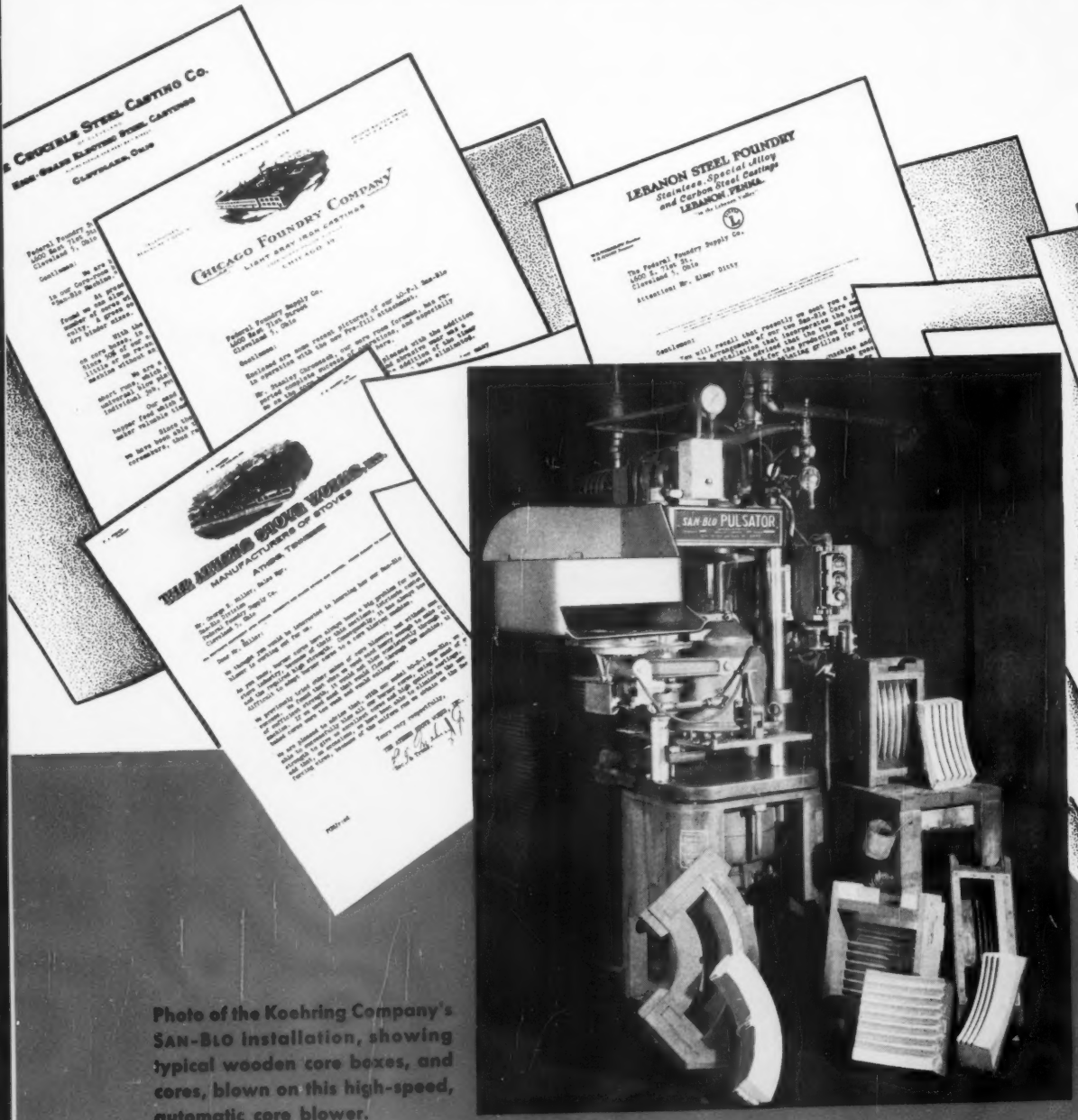


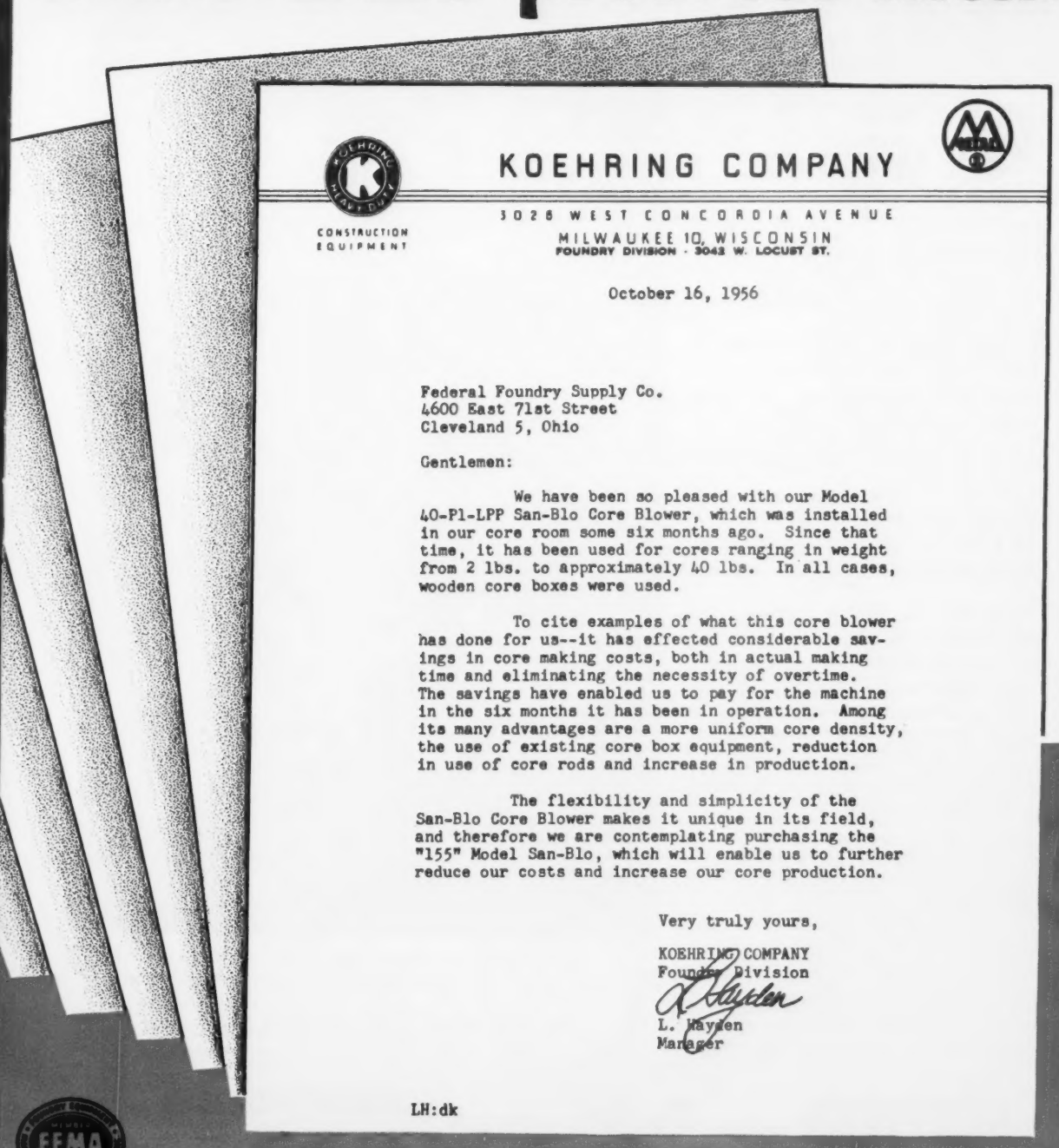
Photo of the Koehring Company's SAN-BLO installation, showing typical wooden core boxes, and cores, blown on this high-speed, automatic core blower.

Manufactured by

San-Blo Division

Circle 618 on Inquiry Card—Page 201

you're after...
SAN-BLO provides them!



KOEHRING COMPANY

CONSTRUCTION EQUIPMENT

3028 WEST CONCORDIA AVENUE
MILWAUKEE 10, WISCONSIN
FOUNDRY DIVISION - 3043 W. LOCUST ST.

October 16, 1956

Federal Foundry Supply Co.
4600 East 71st Street
Cleveland 5, Ohio

Gentlemen:

We have been so pleased with our Model 40-P1-LPP San-Blo Core Blower, which was installed in our core room some six months ago. Since that time, it has been used for cores ranging in weight from 2 lbs. to approximately 40 lbs. In all cases, wooden core boxes were used.

To cite examples of what this core blower has done for us--it has effected considerable savings in core making costs, both in actual making time and eliminating the necessity of overtime. The savings have enabled us to pay for the machine in the six months it has been in operation. Among its many advantages are a more uniform core density, the use of existing core box equipment, reduction in use of core rods and increase in production.

The flexibility and simplicity of the San-Blo Core Blower makes it unique in its field, and therefore we are contemplating purchasing the "155" Model San-Blo, which will enable us to further reduce our costs and increase our core production.

Very truly yours,

KOEHRING COMPANY
Foundry Division

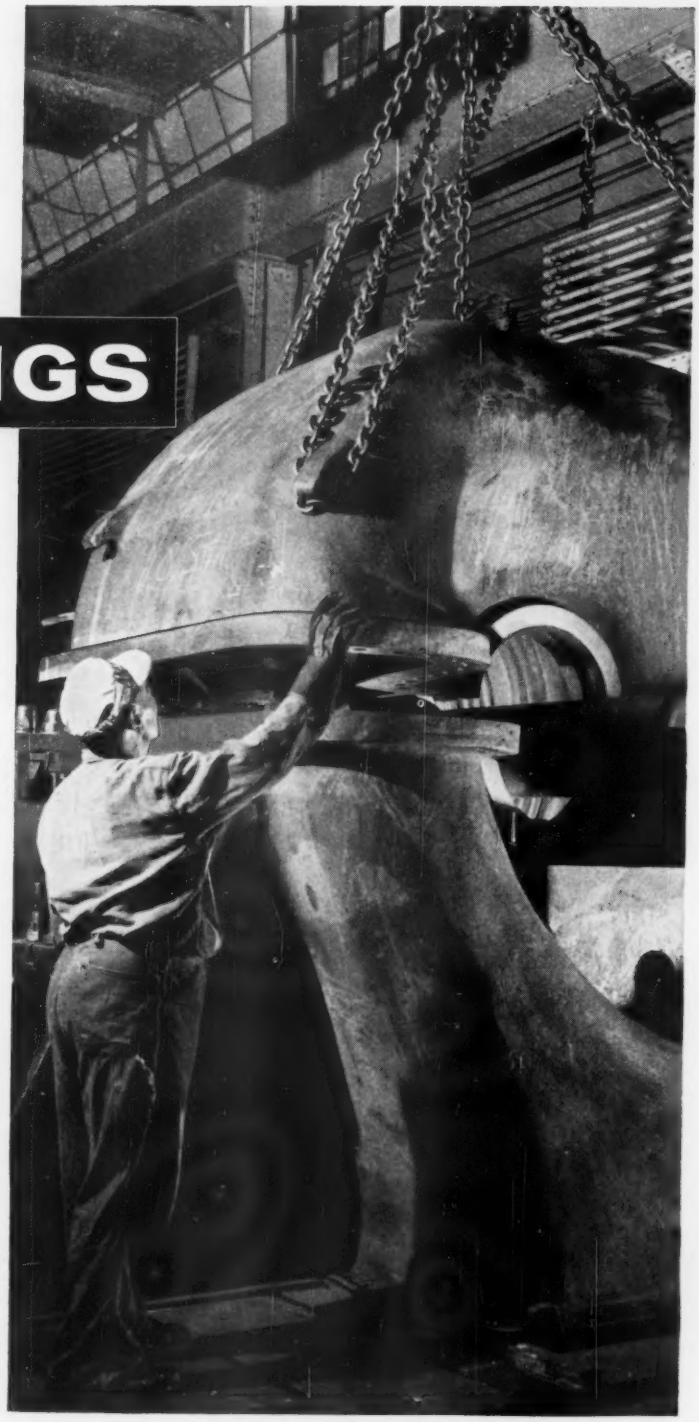
L. Hayden
Manager

LH:dk

FEMA

The FEDERAL FOUNDRY SUPPLY Company 4600 EAST 71st STREET · CLEVELAND 5, OHIO

Ingersoll-Rand does BIG THINGS with Hanna pig iron



Castings made in the Ingersoll-Rand foundries vary in weight from a few ounces to 30 tons. But one thing that never varies is the quality of I-R castings. For over 30 years, Hanna Furnace has been furnishing Ingersoll-Rand with ever-increasing amounts of pig iron that has the high metallurgical qualities and exact analyses required for its engineering grades of iron.

Hanna's wide product range includes the Hanna 38-lb. pig, the foundryman's favorite standard, in all grades, silvery and HannaTite, our special controlled, close-grain iron. Also the HannaTen ingot, a 10-pounder with finer grain structure and no free carbon pockets. The HannaTen also is available in all grades, silvery and HannaTite.

Our customers know that Hanna and its representatives are eager to be of service to them.

Turbine castings, totalling 55 tons, being checked in a test assembly after final machining at the Ingersoll-Rand plant at Phillipsburg, N.J.

HANNA
THE BEST KNOWN NAME IN IRON

THE HANNA FURNACE CORPORATION
Buffalo • Detroit • New York • Philadelphia
Merchant Pig Iron Division of
NATIONAL STEEL CORPORATION

Boxcar has only 5′ door, sand piled level, floor rough, yet . . .

Michigan Tractor Shovel unloads entire 60 tons in less than 100 trips

"This was about the toughest boxcar unloading job a tractor shovel could get!" describes this Midwestern foundry's plant engineer.

"The car had a narrow 5-foot Canadian-type single door. Its floor was fairly rough. Its load of 60 tons of silica sand was piled almost level. Frankly, we didn't think our Michigan could unload it, but decided to give it a try."

200 ft cycles in 1 minute

"First thing we noted," says the operator, "was that Michigan's greater bucket capacity, power and instant shift more than made up for whatever slight maneuverability advantage smaller tractor shovels are supposed to have. Turning past the narrow door slowed the Michigan a bit, but I was always able to get in and out of the car without trouble. Loads averaged 10 to 15 cubic feet of sand each. Cycles of 200 feet between unloading point and boxcar took only a minute or two."

Unloads regular cars under 80 trips

Entire job took only 97 trips. Time compared favorably to unloading 50 to 60 tons of sand from a car with 6-foot door. "We receive 15 to 20 of these per week," says the engineer; "Michigan rarely needs more than 75 to 80 trips to unload any of them." Other Michigan assignments include cleaning the foundry floor . . . moving new sand from hoppers to shakeout bin . . . supplying the gray iron moulders.

Expect longer life

"We first noticed this 15 cubic foot Model 12B at a trade show," reveals another company official. "Here we got convincing proof of the longer machine life its planetary axles and torque converter would provide. We also felt its higher lift would make it easier to do some of our loading and unloading."

And less trouble

"Lower repair time was another expected gain," says the general foreman. "We've had Clark fork lifts and industrial trucks for years; they outlast all others by far. When we saw the same ruggedness built into Clark's Michigan Tractor Shovel, we bought it."

See it in action

Study a Michigan first-hand to see how these advantages can pay off *in your plant*. We'll be glad to let your operators run a demonstrator . . . glad to help you measure output on the type of jobs you want to see done. Call your nearest Michigan distributor to arrange details. For his name and address, send a postcard to:

Michigan is a registered trade-mark of
CLARK EQUIPMENT COMPANY
Construction Machinery Division
2475 Pipestone Road
Benton Harbor 6, Michigan

CLARK® EQUIPMENT

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NEW FOUNDRY SHOT-COOLING

Unique Use of Hewitt-Robins Eliptex

When the Industrial Engineering Division of Giffels & Vallet, Inc. was planning and engineering a new shell molding plant for the Lynchburg Foundry Company, they naturally had to solve many problems. One was the need for separating about 125 tons of hot shot per hour from castings. The shot had then to be cooled and the sand removed.

For this shot handling they selected a series of Hewitt-Robins Eliptex Vibrating Screens, equipped with heavy-duty stainless steel screen cloth, to air cool and clean the shot without the use of water. The shot after being cleaned on a Hewitt-Robins Eliptex shot cleaner is fed to the cooler screen. Air is passed through the uniform flow of shot at 150 CFM per sq. ft. to cool it from 400° F. to less than 150° F. The screen is designed so that air pull is equal at every point on its surface. Rate of travel and depth of the shot bed can be readily adjusted to meet varying requirements.

Says Irving E. Ingraham of Giffels & Vallet, Inc., "The development of these shot cooling screens marks an important advance in shell molding technology. Although we are very pleased to have been in on the development of their use, full credit for this is due to Hewitt-Robins..." Hewitt-Robins, Stamford, Connecticut.

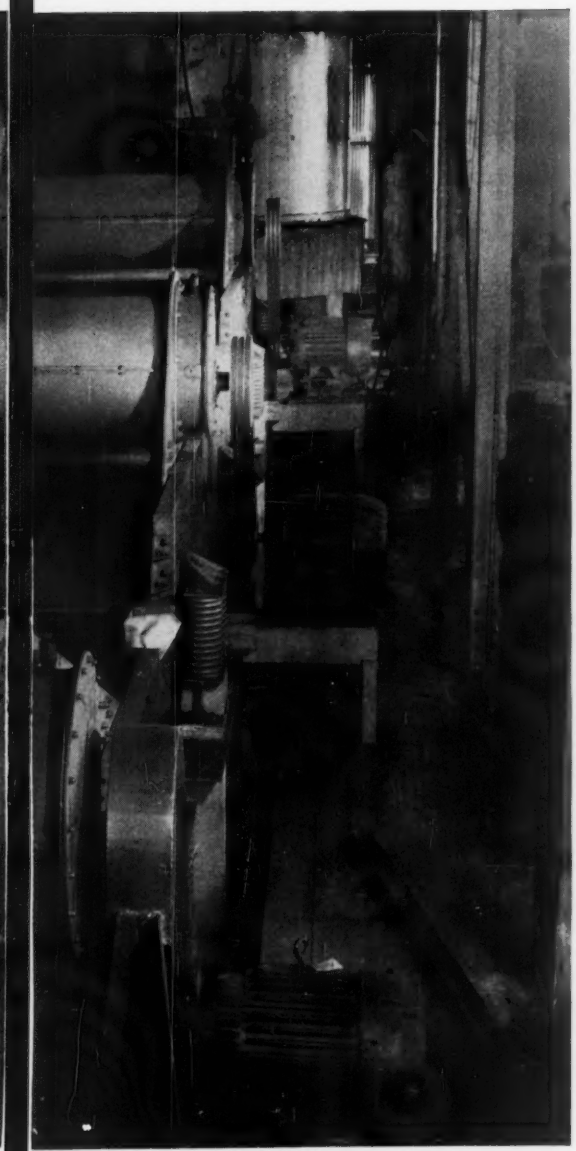
INDUSTRIAL DIVISIONS
PRODUCTS

CONVEYOR BELTING • CONVEYOR MACHINERY • INDUSTRIAL HOSE • VIBRATING CONVEYORS • VIBRATING SCREENS • DESIGN ENGINEERING, MANUFACTURE AND ERECTION OF COMPLETE BULK MATERIALS HANDLING SYSTEMS
JONES POWER TRANSMISSION EQUIPMENT

HR **HEWITT**

METHOD

Screens



-ROBINS

OTHER HEWITT-ROBINS VIBRATING MACHINERY FOR THE FOUNDRY INDUSTRY

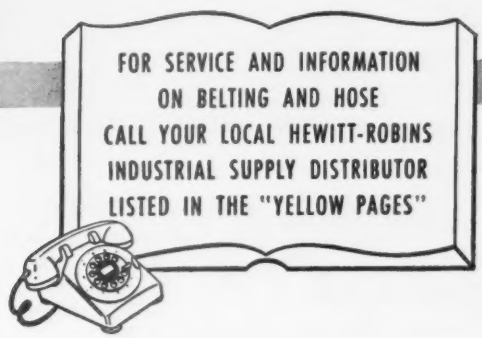
VIBRATING CONVEYORS. Will convey practically any substance in almost any form or condition. Has been used extensively as a foundry mold shakeout conveyor with multiple feeds along its length. Available in several widths up to 150 feet in length with only one vibrator.

VIBRATING FEEDERS. The first practical, fully mechanical vibrating feeder. Easy to install, operate and maintain. Practically noise-free, with high efficiency and high capacity. Requires no electricals except light-duty plug and receptacle.

FLOATEX SHAKEOUT. Made in portable, stationary and mechanical self-discharging types in sizes for castings and flasks weighing a few ounces to flasks weighing 150 tons or more. Full floating principle that shakes the flask--not the foundry. Castings are quickly released along with gaggers, risers and other sand supporters.

SSC UNIT. A compact, completely mechanical unit that performs five foundry operations at one time. (1) Flask Shakeout (2) Sand Screening (3) Lump Breaking (4) Conveyor Feeding (5) Tramp-Metal Trapping. Portable, easy to install. Occupies no more space than average-size shakeout.

SCREENS. A large variety of screens suitable for foundry operations, Gyrex Lumpbreaker Screens, fine mesh Vibrex Screens, high capacity hi-G Screens, and combination screen and feeder units, for any type of sand system.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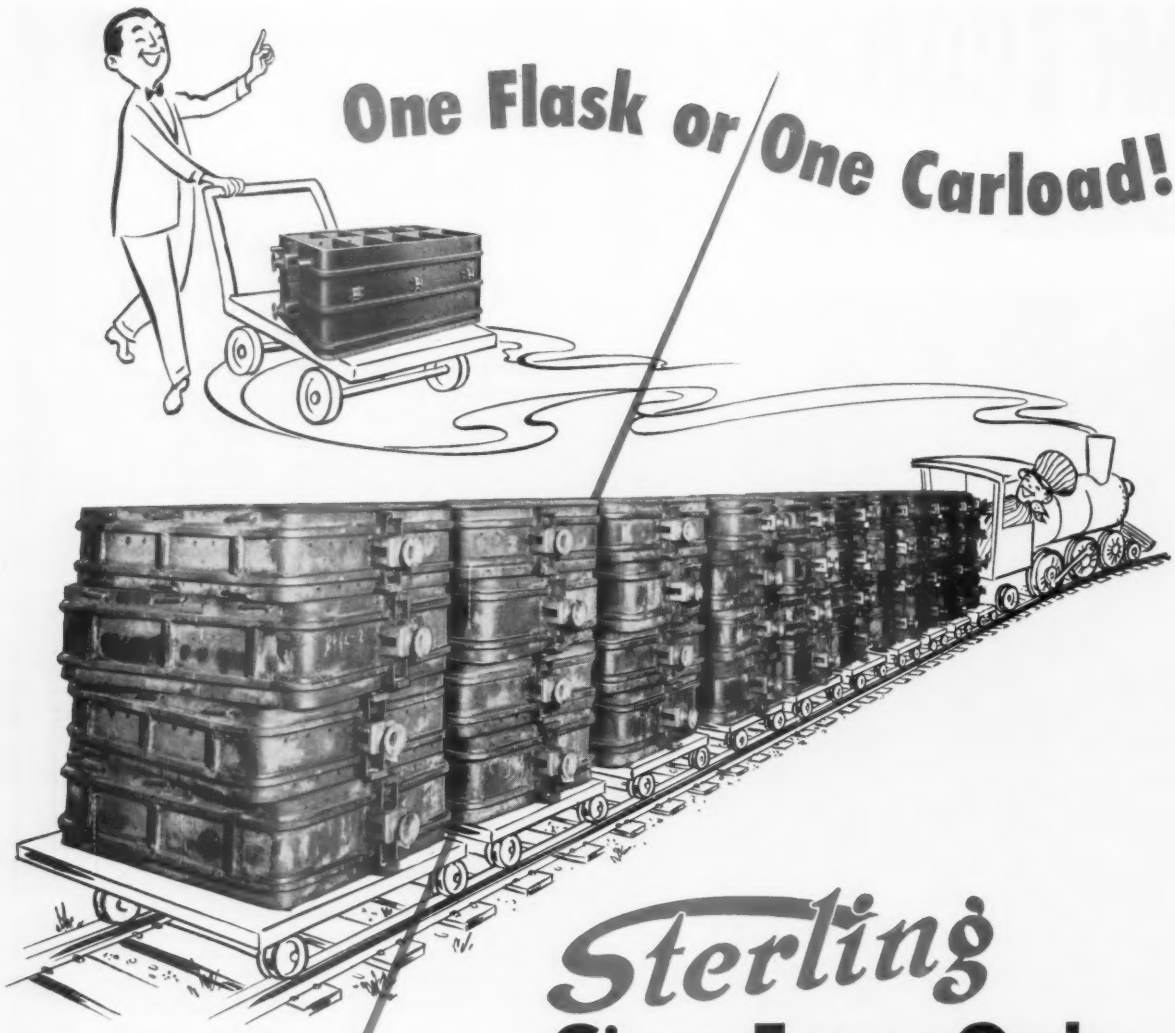
One Flask or One Carload!



Sterling Gives Every Order the Same Careful Attention

Your reputation can rest on the performance of a single flask. So can ours. You can't afford a casting failure. Neither can we. For that reason *each* flask we produce, be it one or ten thousand, is the very *best* we can make. And each order we receive, whether for one flask or a carload, is handled as if it were the most important order in our shop. *It is.*

Next time you need foundry flasks we invite you to investigate the many advantages of STERLING. For complete information please contact our representative . . . or write

STERLING WHEELBARROW COMPANY • Milwaukee 14, Wis. U.S.A.

Problems Ahead

The foundry industry has completed one of its better years. Final statistics probably will reveal that production of castings in 1956 was only slightly under the total for 1955, the second best year in history.

While this record is highly satisfactory, demand for castings was not uniform throughout the year. Some major consuming industries, such as automotive, had fluctuations in production which caused variations in the need for castings. Toward the end of the year, the desire to reduce inventories of components resulted in some curtailment of buying. Furthermore, because purchasing agents now are able to get better deliveries on castings, they are cutting the lead time for orders. These and other factors have produced some spottiness in foundry operations.

In a world plagued with the crisis in the Middle East, the sickening affair in Hungary, and the threat of conflicts in other regions, what may the foundry industry expect for 1957? These tensions point to increased expenditures for our military establishment and some additional demand for castings.

Provided that this nation does not become directly involved in armed conflict, economic experts and leaders of industry believe that business in 1957 will be as good as or better than in the past year. There will be shifting in emphasis, due in part to economic policies of government, but this should not affect materially the total demand for cast products. From present indications, 1957 should be another good year for the foundry industry.

Nevertheless, the industry will be faced with mounting problems. Cost of materials and labor will continue to creep up. Higher costs have resulted in lower profits during the past year, so that everything must be done to counteract that trend.

Competition will increase. Plant modernization has increased the capacity of many foundries since 1951, so that the struggle for business among producers of castings will grow. But the greatest competition will come from materials produced by other forms of fabrication. To keep pace, the industry must intensify its selling drive to convert components to castings.

Buyers of castings, confronted by rising costs, continue to demand higher physical properties, greater dimensional accuracy, better surface finish and other factors that will help cut their manufacturing costs.

To meet these challenges, foundrymen must make even greater progress in producing better castings at lower cost, with more intelligent merchandising a goal of equal importance.

Frank G. Steinebach
Editor

By CHARLES W. BRIGGS
Technical and Research Director
Steel Founders' Society of America

Green Sand Molding of Large Steel Castings

Modern practices in the use of green sand molds for the production of large steel castings are detailed in this paper presented by the author before the recent International Foundry Congress at Dusseldorf, Germany

PRODUCTION of large steel castings in green sand molds is a comparatively recent development. Activities along these lines began during the latter part of World War II and attained a rapid growth during the Korean War. The method was born out of the necessity for the maximum production of large steel castings, but the developments have been so promising and beneficial that the foundries which have adopted it will not return to the old dry mold practice, even during periods of slack production.

There are several terms that should be defined prior to a general discussion of molding methods:

Green Sand Mold—A green sand mold for large steel castings is one consisting of silica sand, a clay type binder (usually bentonite), organic bonds and water. After the mold has been produced with this molding mixture it is either permitted to air dry or is skin dried prior to pouring.

Air Drying—The time of air drying may be short such as only the time it takes to put the mold together, or it may be several days, especially if the mold is completed near the end of the week and air drying takes place over the week end.

Skin Drying—Mold-metal surfaces of the green sand mold may be dried for short periods just prior to pouring the mold. Drying is accomplished either by using portable gas torches before assembly of the mold or by using portable forced air dryers at riser openings after the molds have been closed. It is understood, of course, that the drying period is, in any case, a short one and only the sand within a short distance of the mold cavity face is dried. Such a sand layer is frequently described as a mold skin. Air drying is likewise a skin drying method as the moisture from the green sand mold migrates to the mold surfaces. However, the moisture content of air-dried molds is greater than that of torch-dried molds.

Large Steel Castings—Large steel castings are those weighing more than 5000 lb. In some cases the castings may be rangy and have large over-all dimensions. For example, two large castings of 10,000 lb may vary so that one has maximum section thickness of 10 in. whereas the other has maximum section thickness of only 2 in.

Clay Type Binder—Almost all steel foundries in the United States and Canada employ western (Wyoming) bentonite to bond the sand in green sand molding. A few foundries employ kaolin fire clay as either a full bond or a supplementary bond.

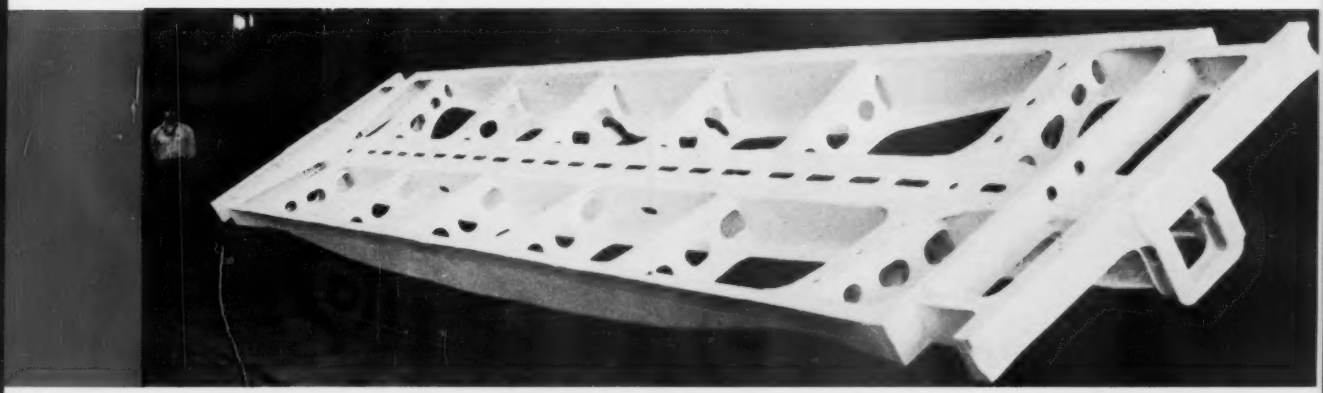
The bentonite so employed is the sodium type. A typical composition in per cent follows: SiO_2 60.89, Al_2O_3 22.17, Fe_2O_3 3.27, FeO 0.42, FeS 0.21, MgO 2.77, CaO 1.28, Na_2O 2.49, K_2O 0.40, TiO_2 0.18, CO_2 0.51, SO_3 0.52, minor 0.02, H_2O 4.87. pH value is 9.25 and viscosity 22.5 cp.

Western bentonite separates into extremely fine particles when dispersed in water. The dispersion is as follows: 96 to 97 per cent finer than 44 microns; 93 to 94 per cent finer than 5 microns; 87 to 89 per cent finer than 0.5 micron; 60 to 65 per cent finer than 0.1 micron.

It is estimated that one cubic inch (16.4cc) of dry western bentonite, when disintegrated in water will yield 9500 million individual flakes with a total surface area of about one acre.

Western bentonite has base exchange properties; in water solution it gives up sodium and potassium ions and takes in calcium and magnesium ions, thus softening the water slightly. It also enters strongly into base exchange with organic bases, extracting them from solutions of their salts.

Type of Castings Produced—There are 31 steel foundries in the United States and 2 in Canada producing castings weighing over 5000 lb in green sand. An additional 16 foundries produce large steel castings but do not employ the green sand practice.



Cast steel frame for a 50-ton paper pulp carrier. Casting is 52½ ft long

Pouring weight of the castings from the 33 foundries range from 8000 to 84,500 lb. Section thicknesses will vary from 2 to 36 in., depending on casting application.

The major casting applications, weights and maximum section thicknesses are given in Table I.

Sand Base—Most foundries (21) have a preference for a washed and dried silica sand as the base of the sand mix; 11 foundries employ a crude sand exclusively and one foundry uses a semi-natural silica sand containing from 3 to 5 per cent clay. Four of the foundries that use the washed silica sand also obtain a crude sand and blend the two together to establish their base sand.

The crude sand is used as it is mined. This sand usually has from 2 to 5 per cent of silt, fines and clay.

The grain shape varies from the round Ottawa sand to the semiangular New Jersey sand and the angular Glassrock sand.

Most of the foundries (25) employ one grade of sand; however, 8 foundries blend two grades of sand. The blend grades are preferred because the foundries obtain a wider sand distribution. An effort to secure a sand with four adjacent screens having over 10 per cent each is considered desirable. Some of the foundries that do not use a blended sand indicate that they would prefer to use the blend but that inadequate storage facilities restrict them to a single grade of sand.

Grain fineness of the purchased sand varies considerably. If the average AFS fineness number is calculated for the sand, they would have the following distribution:

AFS Fineness No.	Number of Foundries
Under 44	5
45 to 49	10
50 to 54	7
55 to 59	6
60 to 65	5

It should be indicated that there is a slow but gradual shift to the finer sands for large castings as there has been for small castings. Use of the finer sands permits reduction in the quantities of silica flour employed, and also prevents rapid drying out of sands during the mold construction.

Sieve analysis of the sands shows that 15 of the sands have a four-sieve sand distribution and 2 sands a five-sieve sand distribution of more than 10 per cent of the sand on four or five consecutive sieves. A typical sand in each of the sieve analysis classifications as set above is given in Table II.

Facing Sand Mix—A large majority (75 per cent) of all steel foundries prepare an all-new facing sand for the green sand molding of large castings. The two most important ingredients of the mix are, of course, bentonite and water. The bentonite content of these sands will normally be from 4.5 to 5.0 per cent. Outside limits for bentonite will be from about 3.8 to 6.0 per cent. The reason for the rather wide variation depends on three possibilities: (1) Green compression strength of about 8 psi is desirable for large molds, (2) a fine sand grain size, such as AFS 63, will require more bentonite than a coarse grain to secure the same

TABLE I—Weights, Thicknesses and Applications of Large Green Sand Molded Steel Castings

Applications	Maximum Weight, Thousand Pounds	Maximum Thickness, Inches
Anvils, die blocks	20 to 30	12 to 36
Anchor flukes, ship hull castings	8 to 40	4 to 10
Mill housings	10 to 30	4 to 18
Press cylinders	6 to 21	12 to 25
Ordnance castings	14 to 30	5 to 7
Frames; crane, truck, press	8 to 36	3 to 10
Roll housings	10 to 20	10 to 18
Hammer rams	8 to 12	30
Tire molds	8	4 to 6
Valve body	5 to 10	2 to 4
Turbines	30 to 42	15 to 24
Bucket lips	5 to 9	3 to 5
Engine and car underframes	40 to 84	4 to 10
Trunnions	17 to 22	18 to 22
Impellers	10 to 12	2 to 3
Slag pots	7 to 15	3
Miscellaneous	8 to 18	8 to 22

This speed ring was cast for a hydroelectric power plant. The steel casting weighs nearly 14,000 lb

Hydraulic press cylinder weighing 10,000 lb, cast in green sand mold, has a cast-in oil reservoir

TABLE II—Analyses of Typical Sands

Per Cent Retained on Sieve	AFS FINENESS NO. Under 44	45-49	50-54	55-59	60-65
20	6.9	0.1	—	—	—
30	17.6	2.3	1.1	—	1.5
40	28.0	19.6	8.1	3.6	16.0
50	24.5	30.0	31.3	28.4	25.3
70	15.6	27.7	35.5	37.2	24.1
100	5.8	15.2	17.6	20.4	15.6
140	0.9	3.9	5.3	6.8	10.4
200	0.3	0.5	0.7	2.4	5.3
270	0.1	0.3	0.2	0.8	1.4
Pan	0.1	0.2	0.2	0.4	0.4

green compression strength, (3) additions of silica flour usually require an increased bentonite content because of the fine particle size of the material.

Kaolin clay is, in certain cases, added to the mix. However, the kaolin addition is accompanied with bentonite and is slightly less or equal to the bentonite addition. The total of the two will average about 5 per cent clay content. Kaolin clay produces a mold of a higher hot strength than can be obtained with bentonite alone. High mold strength to prevent deforming of the mold is necessary for castings of thick section.

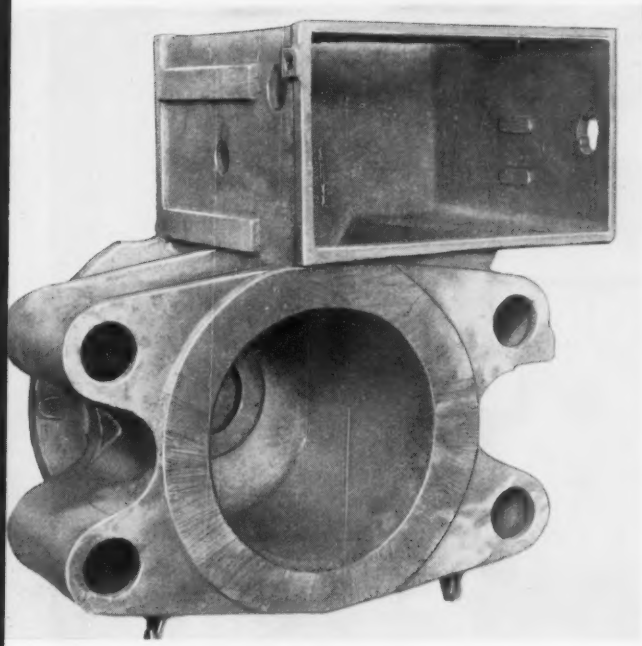
Kaolin clay alone seldom is used as the bond for green sands for large castings. Large quantities of upward of 8 to 10 per cent are required to secure strong molds, the reclamation problems are more complex because of increased fines and dust, and the green plasticity and flowability of the sand is much inferior to the bentonite-bonded green sands.

Water content of sand for large green molds is on the high side if normal green sand practice for small castings is considered. A value of 4.2 to 4.8 per cent is normal; however, a range from 3.7 to 6.0 per cent is possible. If the sand is coarse grained, such as AFS 35 to 45, large quantities (10 to 15 per cent) of silica flour are usually required. Consequently, the water content of the mix will be on the high side—5.5 to 6.0 per cent—in order to prepare a sand of good workability and green compression strength.

Only about 50 per cent of the U. S. foundries find it necessary to add silica flour to the mix. Foundries producing heavy section castings of 8 to 36 in. thick will normally add silica flour. Also, as indicated above, foundries using very coarse sands will likewise use silica flour. The silica flour addition will vary from 2 to 16 per cent depending upon the above two requirements.

The other addition to the green sand mix that is universal is an organic bond or cereal. There are two types — a gelatinized corn flour, and dextrine. The two cereal bonds are often added to the mixture together. Dextrine produces improved green strength and very much greater dry strength than corn flour, but the latter develops greater flowability and plasticity. They are similar in character yet complementary. The total cereal addition is about 1 per cent. The range in values will be from 0.5 to 1.2 per cent addition. The cereal bond is also useful in retarding sands from drying out. Sands that do not contain cereal bond are usually brittle and the surfaces rub off or powder easily.

Many foundries desire to develop hard and firm mold surfaces. To assist them in securing this property they add small quantities of sulfite liquor derived from the pulp paper industry. This bonding agent may be added as a liquid or as a powder. Records indicate that only 25 per cent of the U. S. foundries producing large castings by the green



sand practice use this material. Quantities employed vary from 0.3 to 1.0 per cent. The larger value is added when the cereal binder content is low.

The firm surface is obtained by the migration of the sulfite liquor to the surface with the water during the air, or torch, drying of the mold.

Other additions that are possible, depending on the foundry's program of formulation of the mix, are wood flour, iron oxide, and pitch. Wood flour is added only if the silica flour content is high. Values of about 0.5 per cent are used to reduce the scabbing tendency because of the high hot strengths resulting from the employing of 10 to 15 per cent silica flour. Iron oxide is added in place of silica flour to close the coarse-grained sand and to prevent veining. Usually quantities of about 0.5 per cent of the mix are employed. Pitch can be substituted for cereal binders although it seldom is used.

Examples of the various types of new facing sand mix for large green sand castings are given in Table III.

Properties of New Facing Sand—Green compression strength of new sand facings will vary from 6.0 to 9.5 psi for the various mixtures. A value of 8.0 psi is considered typical. Permeability values range from 70 to 250 depending upon the grain fineness and the type of additions to the sand. Large quantities of silica flour will reduce permeability to the low figure of 70. It is the author's experience that the permeability of a green sand is of little value provided a minimum number of approximately 70 is obtained. Its only use is a check value in routine sand analysis. A record of the permeability value helps to keep the sand in quality control.

Steel foundries in this country seldom report the dry strength properties of green sand as they are not correlated to any hot temperature properties of the sand. The flowability value is always between 75 and 85.

Examples of the high temperature properties of green sand are given in Table IV.

Control testing for green sand properties of facing sand is carried on by all the foundries. Frequency of the testing varies from one test per working shift to a test on each mill mixture. About 20 per cent of the production foundries carry on the testing of every batch. Some foundries have set up their control testing requirements on a ½, 1 or 2 hour basis. Only a few foundries make such infrequent tests as one or two a day.

Reclaimed Facing Sand—Approximately 40 per cent of the foundries produce large castings in green sand molds prepared from a facing sand consisting of reclaimed sand in part or in toto. A few foundries employ a facing sand made up of used sand without reclamation and new sand. Under such conditions the used sand is screened and then mulled dry for one to two minutes prior to making new additions.

Use of all reclaimed sand for green sand molding is possible because of the development of efficient reclaiming units. Some foundries find that they must add new sand to the system to maintain sufficient sand for daily molding purposes. Others find that it is not necessary to add new sand to the facing. New sand comes into the system through the use of new sand in the core mix. In such cases used sand without reclaiming is used in the mix together with reclaimed sand. Examples of the various mixtures for reclaimed sand facings are given in Table V.

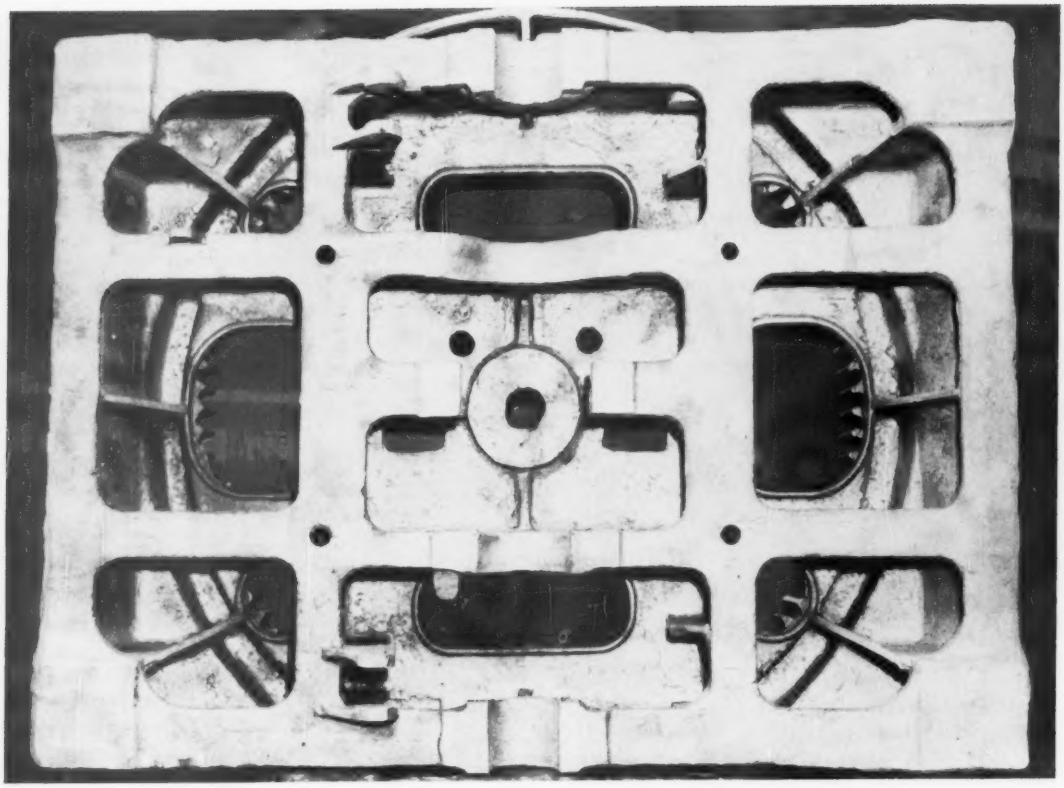
The reclamation methods employed are of two types: Wet reclamation and dry pneumatic reclamation. These methods are about equally used by the foundries contacted in this study. Both methods, when operated properly, produce well scrubbed, clean sand.

Control testing for green properties is carried on very much like that reported previously. If statistical quality control testing is in effect in the foundry, every fifth batch would record sufficient variation if these variations existed.

Only a few foundries make the more detailed sand tests for high temperature properties. Table VI gives some information on four reclaimed sands used as facing sands. It should also be pointed

TABLE III—Examples of Facing Sand for Large Green Sand Steel Castings

	A	B	C	D
AFS No.	60	55	45	50
Bentonite %	5.1	3.3	2.8	5.5
Clay %	—	2.2	2.0	—
Cereal %	1.0	0.8	0.5	0.5
Water %	4.6	5.0	6.0	5.0
Silica flour %	—	3.0	15.0	—
Sulphite liquor %	—	—	—	0.7
Wood flour %	—	—	0.5	—
Green compressive strength, psi	8.0	7.2	8.2	7.5



Cast steel base for power shovel weighs 5000 lb

TABLE IV — Examples of High-Temperature Properties of Various Green Sands

Mixture	M	O	P	S	V
Bentonite %	4.8	4.2	4.7	5.3	3.8
Water %	4.0	3.5	6.5	4.5	5.0
Cereal %	0.85	0.5	0.3	1.7	0.8
Sulphite liquid %	—	—	—	1.1	—
Silica flour %	—	2.2	16.0	—	16.0
AFS grain size	62	51	46	55	50
Room Temperature Properties					
Green compressive strength, psi	7.2	6.5	8.2	6.5	7.5
Permeability	125	175	70	95	70
High-Temperature Properties					
Hot compressive strength (psi)†					
at 500°F	—	150	—	135	—
1000°F	—	135	440	100	—
1500°F	—	260	>1000	320	—
2000°F	—	145	510	>1000	650
2300°F	—	—	—	—	125
2500°F	8	18	110	25	20
Hot deformation at 2400°F (in./in.)	—	—	—	—	.034
Expansion at 2000°F (in./in.)	—	—	—	—	.040

† 12 minute soaking period at temperature

out that the hydrogen ion concentration (pH) is tested in control at a number of foundries on the reclaimed sand mix. Sodium carbonate is dissolved in the added water so as to keep the mix between 7.8 and 8.3 pH.

All-Purpose Sand—Four steel foundries producing large castings in green sand molds prepare an all-purpose sand which is used as both a facing sand and a backing sand. The advantage of an all-purpose sand is that the sand slingers and molding units use only one sand and can sling a hard surface against all parts of the pattern. Otherwise the facing is shoveled on the pattern and rammed with a pneumatic hammer. Beside being a faster method of mold production, the use of an all-purpose sand requires only one sand distribution system in the shop and the preparation of only one sand. Therefore, greater time and attention can be devoted to the control of this sand. Examples of all-purpose sand are given in Table V (mixes 2 and 5) and Table VI (mix U).

Backing Sand—All foundries, other than the four that used an all-purpose sand, employ a backing sand which is used sand (heap sand). Most of the foundries screen and mull the sand prior to its use as backing sand.

For the most part backing sands are prepared to either a green compressive strength range or to a moisture content range. Average green strength of these sands will be about 6 psi. A moisture content of 3.5 to 4.2 will usually suffice to develop the desired plasticity and green strength.

Bentonite additions to the backing sand usually are low and will average from 0.5 to 1.0 per cent. In some cases additions of bentonite are seldom made. The reason for this condition is that the facing sands contain sufficient bentonite to pro-

TABLE V—Examples of Reclaimed Facing Sand

	Used + New 1	Used + Reclaimed 2	Used + Reclaimed + New 3	Reclaimed 4	Used + Reclaimed + New 5
Used sand without reclamation %	62.8	79.0	29.4	—	74.4
Reclaimed sand %	—	19.8	29.4	94.8	24.0
New sand %	35.2	—	29.4	—	1.0
AFS grain size	51	52	59	53	47
Bentonite %	1.7	.9	2.4	3.5	—
Clay %	—	—	1.0	.7	—
Cereal %	.3	.3	.6	.4	.3
Silica flour %	—	—	7.8	—	—
Water %	3.2	3.8	4.5	5.0	—
Green compressive strength, psi	6:5	6.7	9.0	7.0	8.5
Green permeability	150	180	105	140	150

duce, in some cases, green strengths of upwards of 9 to 10 psi. When these sands are reused they develop green strength of 6 psi without any additions other than perhaps water. In some cases small amounts of cereal (0.2 to 0.4 per cent) are added to the backing sand to improve their workability and to keep the sand from drying out.

Backing sands usually show permeability values from 100 to 170, and green deformation values of 0.020 to 0.035. Testing control varies from once a day to once an hour, with an average value of control tests four times daily.

Mulling Conditions—The batch size used in mulling green sands for large steel castings varies from 700 to 4000 lb. However, a majority of the foundries employ a batch size of 1400 to 1700 lb.

The order of additions varies somewhat but by far the large majority of foundries (28 out of 33) employ the following order in making additions: (1) Sand, (2) silica flour, if used, (3) bentonite, (4) clay, if used, (5) cereal binder, (6) other dry ingredients such as iron oxide, wood flour, pitch, sulfite liquor, etc., (7) water. In most cases the dry materials are mulled from 1 to 2 minutes dry prior to adding the water.

The minority group of foundries vary their additions by putting the water into the muller early. In three cases a part or all of the water is added to the mill first and then the sand is added and mulling proceeds. The remainder of the water, if any, is added after all the other ingredients have been added. The other two foundries add the sand and silica flour, if needed, and then make the water addition.

Here are the reasons for the variations in mulling practice. The majority group believes it is necessary that all the dry ingredients be well mixed and proportionately distributed throughout the mixture before the water is added. The other group holds that mulling is the operation which results in close packing of sands, and since the water films around the grains play such an important part in the close packing arrangement, it is advisable that the water and sand be added together. Close-packed sands are more resistant to metal erosion. Some recent studies on clay-film thicknesses and clay-water ratios have shown important effects on the casting surface evaluation.

Mulling times will vary with the type of muller employed. Twelve foundries employ the Speedmullor, and the mulling times range from 1½ to 3 minutes. Following is a mulling cycle (in seconds) for one foundry using the Speedmullor: 3 water in, 2 water delay, 12 sand added, 3 fines removed by exhaust, 5 binder addition, 10 binder dispersion, 70 mulling and cooling, 15 discharge—a total of 120 seconds.

The mulling time on standard mullers will vary from 5 to 12 minutes with an average of 8 minutes. About one-fourth of this cycle will be allocated to the thorough mixing of the dry ingredients prior to the addition of water.

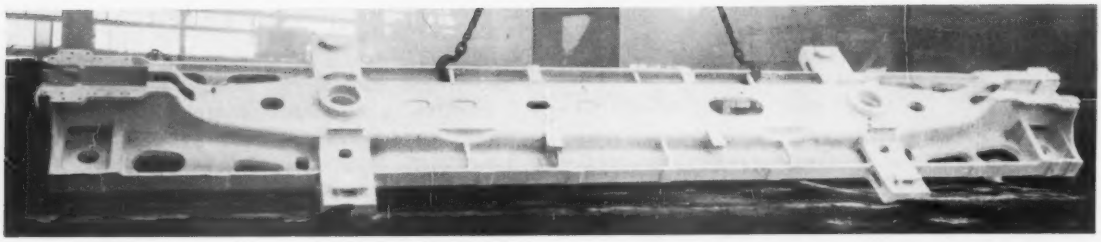
Only 20 per cent of the foundries have the necessary equipment which makes all additions automatically based on a time cycle. All of the foundries would like to have automatic equipment because it eliminates the personal errors. Seventy-five per cent of the foundries add the ingredients by weight. The remainder use weight for some materials and volume for others. A few foundries use volume measure exclusively. It is realized that the weight measure is the more accurate and the preferred method. In most cases (75 per cent) water is metered.

A number of the foundries have made an effort to control the temperature of the sand at the muller. Others have prepared large heap sand storage to control temperature. However, 40 per cent of the foundries record the temperature of the sand mix and, through aeration control and water addition at the muller, they are able to lower the temperature of the mulled sand. Also, eight foundries record humidity conditions at the time the mix is being made and the water content is varied. The sands dry out very little on humid days and, therefore, the water content can be re-

TABLE VI — High-Temperature Properties of Used and Reclaimed Facing Sands

Facing Mixture	O	P	U	Y
Used sand %	62.8	90.7	80.6	—
Reclaimed sand %	—	—	17.8	74.4
New sand %	35.2	—	—	—
Bentonite %	1.7	2.4	1.2	4.5
Fire clay %	—	—	—	3.6
Water %	3.2	4.8	4.3	4.5
Cereal %	0.3	1.0	0.4	0.5
Silica flour %	—	5.9	—	12.5
AFS grain size	51	46	49	50
Properties				
Green compressive at 70°F, psi	6.5	9.5	7.5	9.7
Hot compressive strength, psi				
at 500°F	75	—	—	—
1000°F	100	270	—	—
1500°F	400	860	—	350
2000°F	110	460	—	740
2500°F	5	50	30‡	4
Contraction at 1500°F (in./in.)	—	—	—	0.005
Expansion at 1500°F (in./in.)	—	—	—	0.015

† 12-minute soaking period
‡ 2-minute soaking period



This steel casting is the frame for a 1000-hp diesel switching locomotive

duced without producing any detrimental effect.

Forty per cent of the foundries have the mullers controlled by a timer. This permits the muller operator to maintain a definite cycle of additions and mulling. Such methods are, of course, most advisable.

Sand Transportation and Storage—After sand for large casting molding is mulled, it is transported to the various molding stations primarily (55 per cent) by open boxes or buckets moved by the crane. The boxes usually handle from 50 to 90 cu ft of sand. One-third of the foundries employ conveyor belts to move the sand by overhead means to feed hoppers. Slingers are also fed from the feed hoppers by conveyor belts.

Some foundries move the sand by having industrial trucks handle sand buckets. Others use bucket conveyors to sand storage and then conveyor belts to distribution centers.

Sand is stored on the molding floor primarily in open boxes or in the slinger storage hopper. There is also some storage in feed hoppers and closed bins. In a few instances the backing sand is stored in heaps on the foundry floor. Approximately 65 per cent of the foundries protect the stored sand from drying out either by using covered bins or by covering the container with wet burlap sacks. However, most operators admit that the wet bags are not too efficient and indicate that the sand mixture should be used as soon as possible and that the sand should not be permitted to be stored over night.

Molding—As might be expected, 85 per cent of the foundries use sandslingers for molding large castings in green sand. Four foundries employ large jolt machines as well as sandslingers. The other foundries employ sand fillers and ram the molds with pneumatic hammers. Also, as previously described, most of the facing sand is placed on the pattern, rammed with pneumatic hammers and the backing sand added by a sandslinger.

The quantity of reinforcer bars and spacers in a cubic foot of green sand mold varies greatly, depending on the weight of the casting, the length and complexity of the casting. Some operators estimate a use of from 10 to 30 lb of bars per cubic foot of mold.

All foundries use scab-nailing of specified areas of large green sand castings and about 88 per cent employ large-headed nails at the gate areas. The majority of foundries will nail the cope surface lightly with 1 to 6 in. centers depending on pattern design such as variations from convex to concave. A few foundries do not employ nailing on cope surfaces, and 25 per cent of the foundries will nail the cope surfaces extensively.

Drag surfaces are nailed lightly by the majority of the foundries; however, 35 per cent of the foundries do not employ any scab nailing of the cope surface. Over 50 per cent of the foundries do no nailing on vertical mold walls. The others limit nailing to as little as possible. If sections are very heavy, some nailing is done.

Mold hardness, as determined by the indentation hardness tester, will be a minimum of 70 for all mold cavities. Values from 80 to 85 normally are obtained.

The maximum length of time that a pattern will remain in the mold will, of course, depend entirely on the casting being produced. However, in some cases 100 to 150 hours have been required. Minimum times are from 2 to 4 hours. About 30 per cent of the foundries are producing molds which require the pattern in the sand more than 8 hours.

Skin Drying and Mold Washes—Heat is used by 81 per cent of the foundries to skin dry the molds. About one-half of these foundries use portable hot air circulator dryers. The others use gas torches played directly on the mold surfaces. Those that do not employ heat either permit the mold to air dry up to 24 hours after molding, or pour the molds green shortly after molding is completed.

A mold wash is employed by 94 per cent of the foundries on the large green sand molds. In most cases the wash or coating is sprayed on the molds and then the skin is dried. In some cases a partial drying is undertaken before the wash is sprayed on and then the drying is continued and completed. The depth of the dried layer of sand from the mold face will be about ¼ in. as a minimum and about 1½ in. as a maximum. Some drying will extend above the 1-in. thickness but the gradation between only traces of moisture and the full moisture content of the mix will be fairly marked. The average depth of drying is about ¾ in.

A majority of foundries employ a proprietary wash that comes prepared for use; only 33 per cent of the foundries prepare their own wash. The washes made up by the foundry are of the main types — silica flour washes and a zircon wash.

The silica flour wash is produced from a mixture of silica flour, bentonite, cereal or resin, and water. In some cases alcohol is added. The zircon wash consists of zircon sand and flour, bentonite, and

water. Some mixes will also contain a proprietary wash base. These washes are mixed to 45 to 55 degrees Baume.

Usually the molds are given the skin drying before closing in the mold. However, in a number of cases the large molds are set up for pouring and then dried by portable air dryers.

Molds are usually poured when the mold skin is at a temperature of under 100°F and in most cases at shop temperature.

Cores for Large Green Sand Molds—All the foundries use baked cores for the large green sand molds. Since the production of these cores follows the regular practice they will not be discussed in this report. However, 30 per cent of the foundries also use green sand cores in large green sand molds. Both green topped cores and full green cores are in use.

Most of these foundries employ the same mix for green cores as they used for the green facing sand. Only three foundries have developed a special core mix. These mixes are of lower green strength than the facing sand; the primary difference in the mixture is a lower bentonite content.

Half of the foundries that produce green sand cores use them shortly after they are made. No effort is made to see that they are air dried. Two foundries air dry the cores from one to two days. The remainder of the foundries skin dry the cores with torches from 30 minutes to 3 hours. These cores are usually large and a dry skin of ½ to 1 in. is desired.

About half the foundries that produce green sand cores use a core wash, the others do not. These washes are similar to those used for the molds.

Green sand cores are being used in some fairly large castings—for example, castings of upwards to 24,000 lb pouring weight with 18 to 20 in. metal sections. No trouble was encountered but it should be indicated that the cores were heavily vented.

Also, it should be pointed out that a number of foundries are employing fast drying oils for large cores for green sand molds. These cores are baked in the conventional gas-fired controlled temperature ovens.

Main frame for a rock crusher weighs 11,000 lb

Some of the Problems—The main difficulty with green sand molding practice for large steel castings is the same as for most any practice—one of quality control. If all procedures are maintained within limits set, good results normally can be expected. One of the principal difficulties is failure to ram the molds properly. If this is the case, the mold hardness is low and the molds erode badly and produce castings with poor surfaces containing eroded sand. One of two ways to overcome this condition is to use the sandslinger exclusively and go to an all-purpose sand which can be used for a facing as well as a backing sand. The other method would be to have a divided reservoir on the sandslinger and to go from new facing sand to backing sand at will by drawing from each feed bin.

Some foundries indicate that there is difficulty with pattern draw and excessive pattern damage resulting from ramming to a rigid control at high mold hardness levels of 85 to 90.

Another problem is that it is difficult to prevent molds from drying out during the ramming and finishing operations on large molds because of the time involved. The drying-out tends to produce friable mold surfaces that are difficult to patch. Such conditions often lead to sand inclusions in the casting face.

Improper procedures will result in scabbing and metal penetration. Such a condition is the result of improper sand preparation and control. Sometimes muller operators forget to put in the correct amount of silica flour in coarse-grained sands, with the result that metal penetration becomes a serious problem.

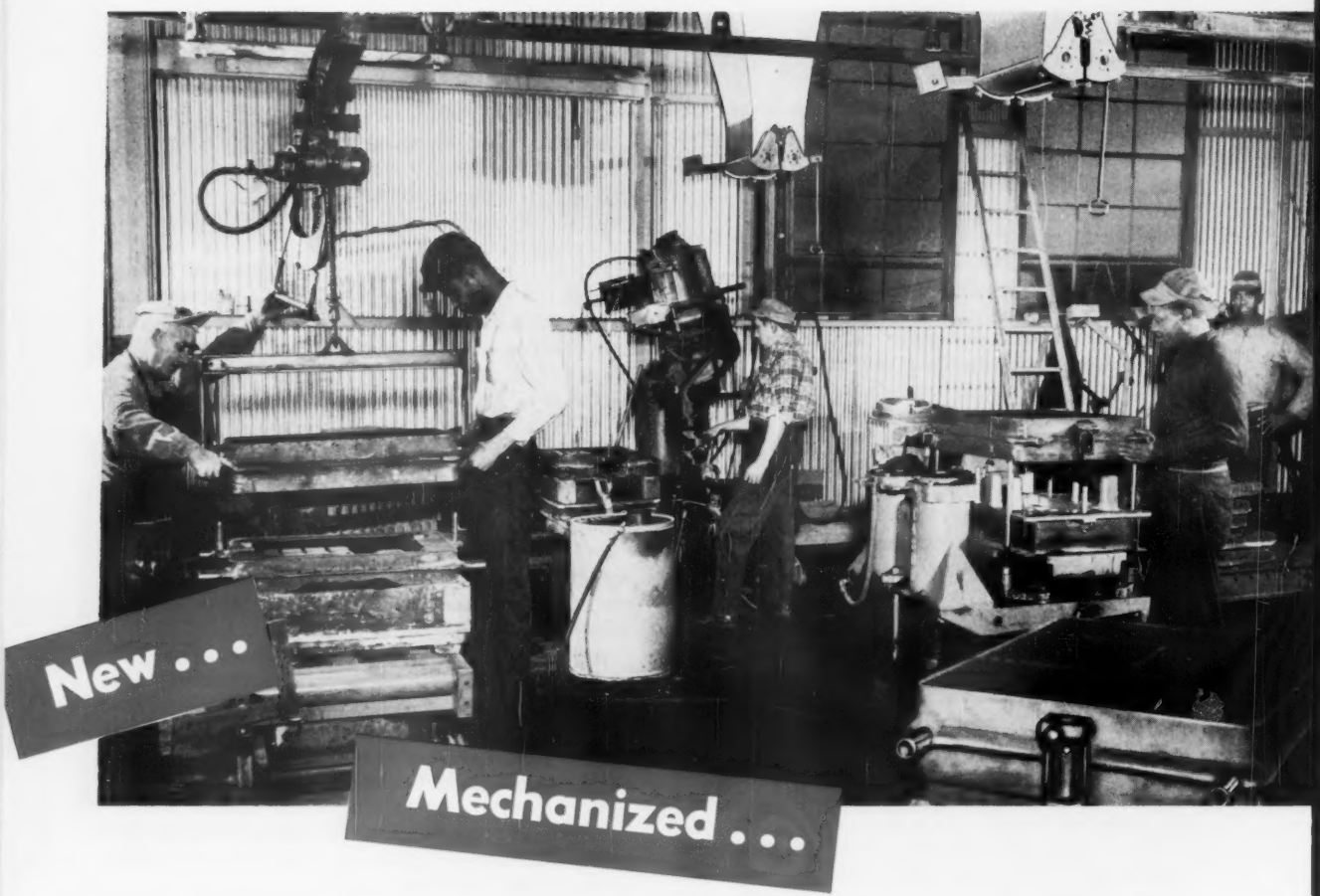
Skin drying must be controlled in all its operations because in some cases the large quantities of water vapor given off cause defective castings unless the molds and cores are extensively vented.

Foundries using green sand practice for large steel castings feel that it offers no more difficulties than dry sand practice, provided controls are set and maintained. In fact, the foundries have indicated that they have been able to produce better steel castings with green sand molding practice than with any molding practice they have used previously.

The advantages of green sand practice can be simply enumerated:

1. Shorter molding time in producing large castings because the long drying times are eliminated.
2. Lower costs because of lower drying costs. Production of built-up core molds is costly and time-consuming.
3. Good degree of mold accuracy because of a minimum of mold handling.
4. Less hot tearing than in dry sand molds or built-up core molds, therefore less costly and time-consuming repairs.

Editor's Note: Sources of photos include Commercial Steel Casting Co., General Steel Castings Corp. and Locomotive Finished Material Co.



NONFERROUS FOUNDRY

Stresses High Quality

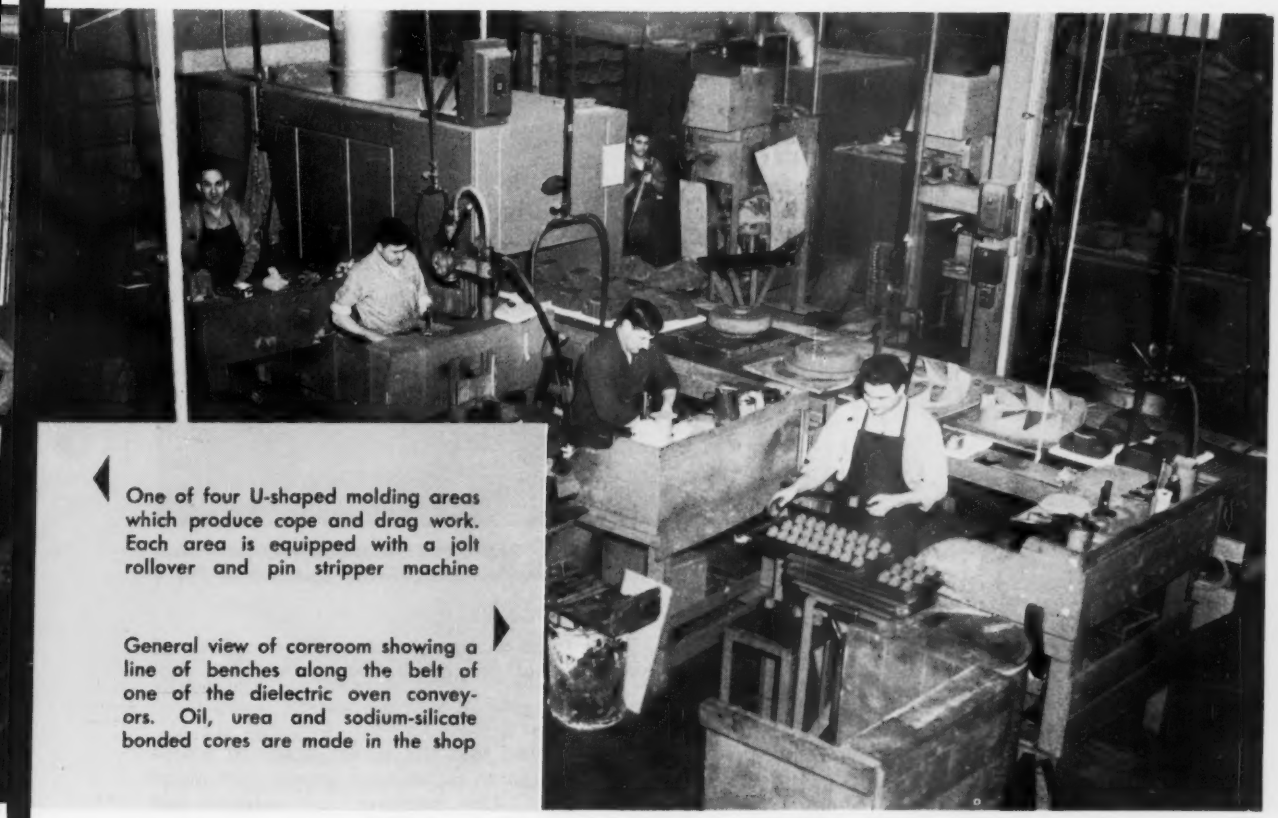
By ROBERT H. HERRMANN
Associate Editor

DURING half a century of growth, Fischer Casting Co., Middlesex, N. J., has build a reputation for producing high quality nonferrous castings. About three years ago the company celebrated its 50th anniversary by moving into a new building to further its efforts for still higher quality castings through the use of modern, mechanized equipment and up-to-date techniques.

At the Fischer foundry, 160 employees, working a one-shift, 5½-day week, produce over 300,000 lb of bronze and 100,000 lb of aluminum castings a month. The foundry is operated by the three Fischer brothers—Arthur, George and Robert—with Louis Fischer as chairman of the board. It is a jobbing foundry making use of up-to-date methods of production and quality control. Molding and coremaking methods include green, urea and sodium silicate-bonded sand and permanent molds.

Castings produced weigh from a few ounces to hundreds of pounds. All bronze alloys are used to make such castings as meter components, electronic parts, pressure valves, dairy equipment and chemical industry parts. Both primary and secondary aluminum alloys go into parts for the food processing, electronics, chemical, material handling and aircraft industries.

Molding Is By Machine—The line of machines in the molding department includes thirteen squeezers, four jolt rollovers and four jolt pin strippers. Molds are made in steel flasks ranging in size from 12 x 16 to 48 x 48 in. and in cherry wood snap flasks



One of four U-shaped molding areas which produce cope and drag work. Each area is equipped with a jolt rollover and pin stripper machine

General view of coreroom showing a line of benches along the belt of one of the dielectric oven conveyors. Oil, urea and sodium-silicate bonded cores are made in the shop

ranging in size from 10 x 12 to 18 x 18 in.

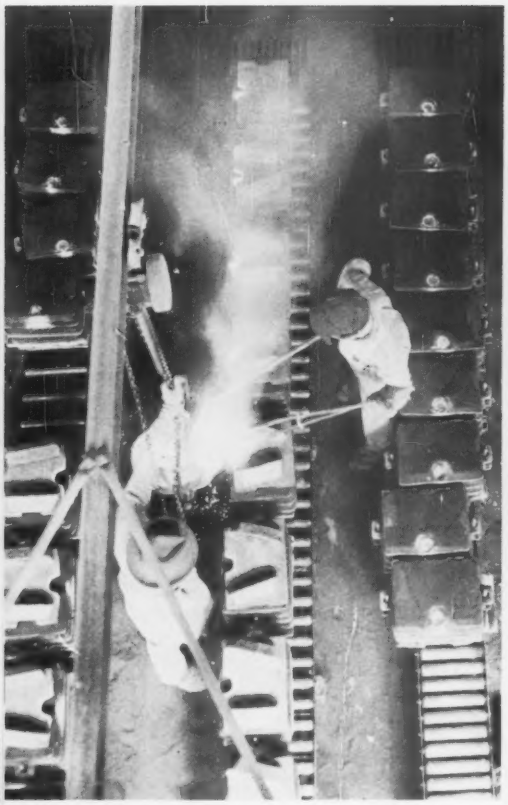
The larger work is produced on pairs of cope and drag machines set in four U-shaped work areas formed by gravity roller conveyors about 18 in. off the floor. Drags are made on the jolt rollovers and copes on the pin strippers. An air hoist on the bridge beam at each U is available for setting off drags on the conveyor section forming the base of the U and for closing the molds after the cores have been set. Molds are poured on both legs of the U's forming the first and second areas. They are dumped to a floor grate at the first area and pushed to a transfer car from each leg of the U at the second area for movement to a hooded shakeout.

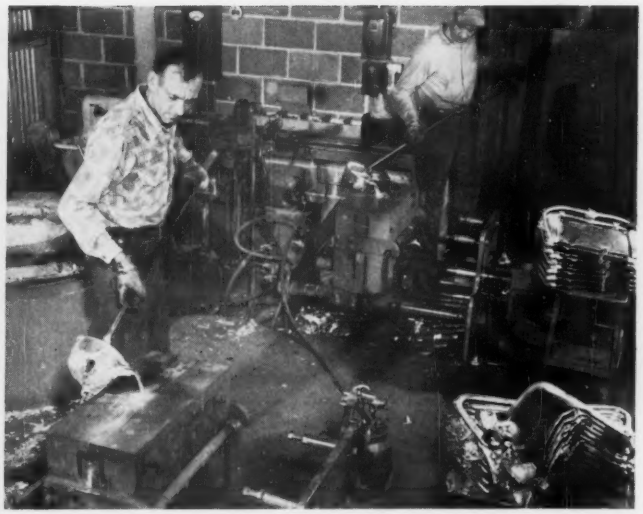
Two additional roller conveyor sections hold molds for pouring and are located inside the legs of the U's forming the third and fourth work areas. Finished molds are rolled off the base leg of the U to a transfer car for movement to these additional pouring conveyors. Snap flask work is handled by the 13 squeezer machines, and two roller conveyor sections service each machine. All conveyor sections are about 20 ft long, and poured molds are dumped off the ends to floor grates—with the exception of the one work area where the largest castings are made and dumped to the hooded, vibrating shakeout.

Molding Sand Is Handled Automatically—Shakeout sand falls through the grates to an under-floor belt conveyor which feeds a wider belt under the vibrating shakeout. That belt discharges to a cross belt, and sand is carried over a magnetic pulley to a bucket elevator. The elevator discharges to a chute which feeds sand to a rotating screen over a 90-ton capacity storage bin.

Sand flows through a pneumatically operated gate in the bin bottom to a volume-measuring hopper over a 1000-lb capacity muller. The measured

Above, nine gas-fired pit furnaces melt aluminum. Bronze is melted in 14 crucible furnaces





Pouring aluminum into two hydraulically-powered permanent mold machines. The Meehanite molds are operated at 750°F

Green sand molds made on the squeezer machines are poured on roller conveyors and dumped to floor grates when cool

Boxes of castings are pushed on roller conveyors in the cleaning room to tables for visual inspection and gaging

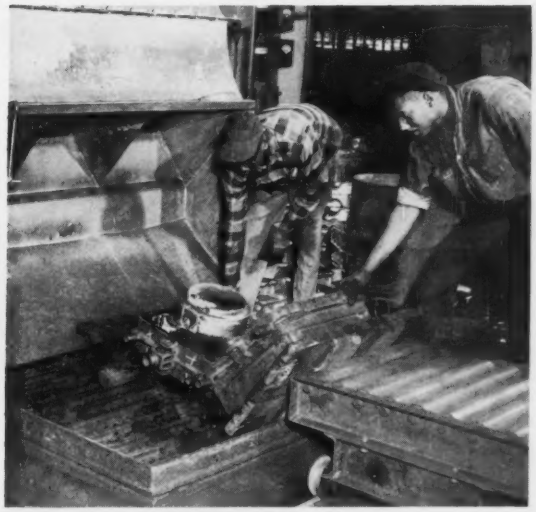
sand is dropped into the muller first and cooled by a blast of air to reduce sand temperature about 20 per cent. Dry additives are weighed and dumped into the muller by hand, and water is metered to achieve 5 per cent moisture content. The muller is instrumented for automatic, continuous cycling.

Mulled sand is dropped to an inclined belt conveyor below floor level and discharged into a bucket elevator which feeds a second inclined belt. A distributing belt carries sand over hoppers serving the molding machines. A man on a catwalk along that belt operates plows for filling the molders' hoppers.

The sand described above is used primarily for mold backing. A facing mixture is prepared from natural Albany sand blended with old sand in a separate muller. Water content of this sand is 4½ per cent. Mulled sand is delivered in a wheelbarrow to molding stations.

Use Several Core Sand Mixes—Core sand is a washed and dried silica sand of 70 AFS fineness delivered in trucks while it is still hot to prevent moisture pick-up. It is dropped into a hopper feeding a bucket elevator for raising the sand to the tops of two, 70-ton capacity silos. The silos have shelves near their tops which are filled with cool sand before every shipment. Consequently, the hot sand slides past the filled shelves to the bottoms of the silos where it remains until cool. Sand from each silo can be raised by the elevator and deposited on the shelf of either silo.

Sand flows from the shelves by gravity chutes



A transfer car carries molds poured at some of the U-shaped molding areas to a hooded shakeout

into the sand preparation area of the coreroom. Hand-operated gates on these chutes release sand to a weigh hopper mounted on wheels. The hopper can be rolled along floor tracks for positioning under the two sand chutes and at each of the two 400-lb capacity mullers. A hand gate discharges sand from the weigh hopper to the mullers. Dry urea resin binder and cereal additives are hand weighed and water is metered. The various mixtures are colored with powdered dye to indicate use of the mix for hand rammed or blown cores and for use in molds poured with bronze or aluminum.

CO_2 process sands also are prepared in these mullers. They contain 4 per cent sodium silicate and no other additive. Mulling time is 3½ to 4 minutes.

Small quantities of 40 and 160 AFS fineness sands are used in some core mixes. Those sands are delivered to the foundry in 100-lb bags.

Mulled sand is delivered in a wheelbarrow to bench stations and blow machine hoppers.

Cores are made in stand and bench blowers. Benches are available for hand work. Urea-bonded cores are dried in two dielectric ovens and two gas-fired shelf ovens. Pasting and definning is done on a long bench at the end of the coreroom nearest the foundry molding area. Some cores are sprayed with a graphite lacquer solution. A hooded work area is provided for that operation. Finished cores are grouped on wooden trays and delivered in a wagon to the molding area.

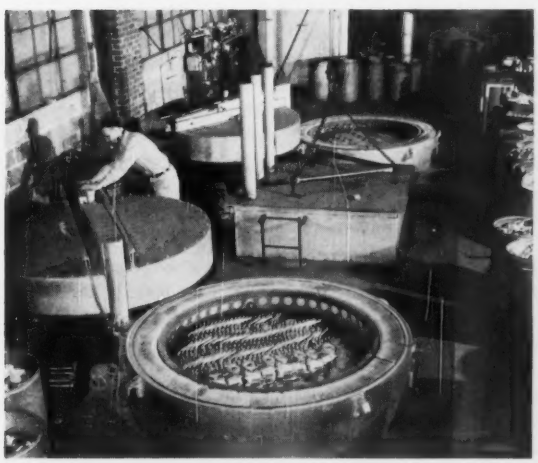
Sodium-silicate bonded sand cores are blown or hand-rammed. Boxes containing blown cores are vented ideally for gassing. Closed-end boxes containing hand-rammed cores must be vented to assure uniform distribution of CO_2. Most cores are gassed with a rubber cup at the end of a hose attached to a portable gas cylinder. False bottom coreboxes have been made for some of the cores produced in this shop. Gas is introduced through a hose connection into a chamber at the bottom of the box. Vents in the false bottom, forming the top of this chamber, permit CO_2 to permeate the core. A plywood cover laid loosely on top of the box slows movement of the gas through the core. CO_2 is used at pressures from 30 to 50 psi, and gassing time ranges up to 15 seconds, depending upon section thicknesses of the core.

An example of one of the CO_2 process cores is a shield guard housing, measuring 13 x 18 x 18 in. Previously it was a three-piece assembly. It is being made in one piece with sodium silicate sand and CO_2.

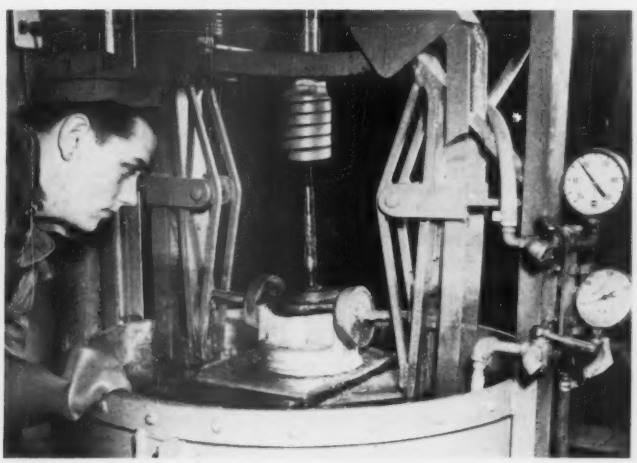
Melting—Aluminum and bronze ingot is delivered to the foundry yard by highway truck and moved into the melting room by fork truck. Aluminum is melted in nine gas-fired pit furnaces of 500-lb capacity. Metal is ladled out of the furnaces by the pourers, and molds are poured at 1200 and 1400°F.

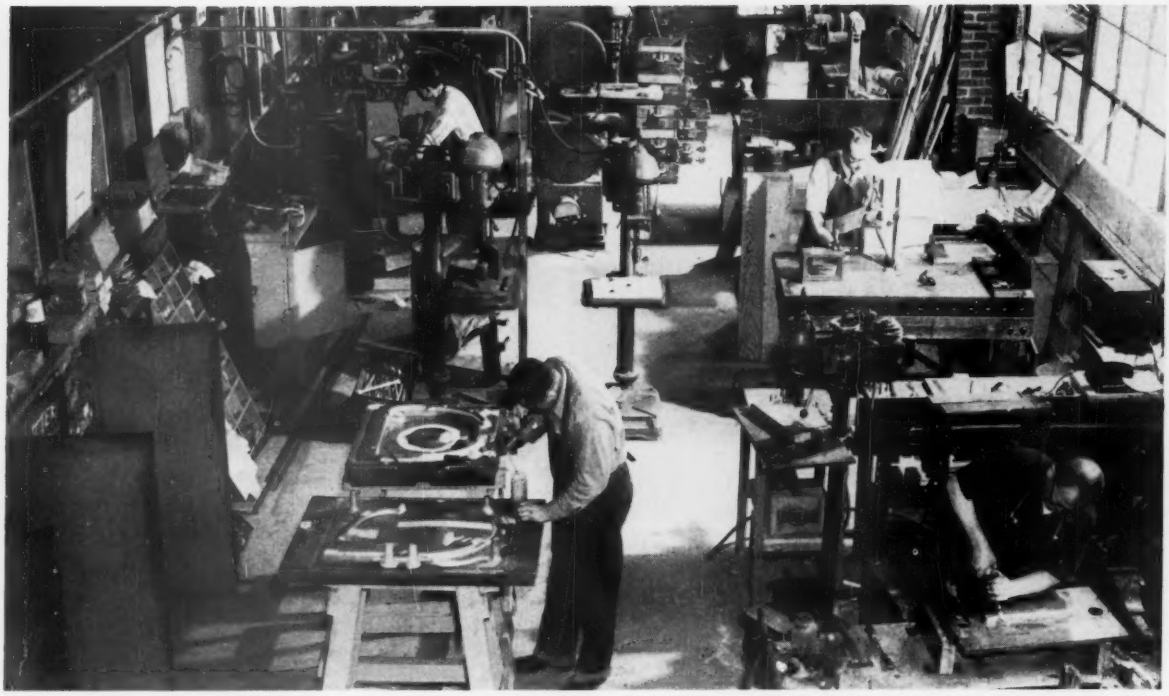
Bronze is melted in 14 gas-fired crucible fur-

Heat treat facilities include two electric pit furnaces with a water quench tank between them



Castings for pressure-tight uses are submerged in a water tank and tested with air at 100 psi





Patterns and permanent molds are repaired and gated in this well equipped shop located off the coreroom. Most new patterns come from outside shops

Magnetic particle inspection is one of a number of quality control measures used by the foundry

naces in heats of approximately 210 lb. An electrically raised and propelled hoist-carrier is used to lift crucibles from the furnaces and set them on a small car on rails. The car is pushed under a hood where metal temperature is taken and silicon copper and phosphor copper additions are made. Then the car is pushed under a bridge crane, spanning the mold pouring area, and the crucible lifted off the car with the crane hoist. Bronze pouring temperatures range between 1850 and 2400°F.

Permanent Mold Work—Aluminum permanent mold castings are made in nine machines. Six of these are the type which involve attaching the mold to a tilting furnace for pouring the castings. These furnaces hold 200 lb of aluminum, and molds are poured at 1250-1350°F. The remaining three machines are standard hand-poured, hydraulic units. Metal for these machines is melted in a 1000-lb capacity gas-fired reverberatory furnace and held in six, 500-lb gas-fired furnaces from which it is hand-ladled to the machines. Molds are of Meehanite and are operated at 750°F. Castings from this operation are handled in the same cleaning room servicing the sand foundry.

Cleaning Room Operations—Castings from the floor grates and shakeout grid are moved by wheelbarrow to a hooded knockout station. Operators use air hammers to remove cores and adhering sand, and then place bronze castings and attached gating metal in wheelbarrows for transportation to an airless blast tumbling machine to be cleaned with steel grit. After blasting, the castings are wheeled to four tables where they are inspected visually.

Two cut-off wheels and three band saws remove gating metal from aluminum and bronze castings. Gating metal is segregated for movement to the melting department. Castings are placed in 12 x 24-in. tote boxes on three waist-high gravity roller conveyors. The boxes move past double-end grinders, machines equipped with cone wheels or rotary files which clean internal and hard-to-get-at places, and to benches where portable grinders are used for touch-up work.

Medical facilities under supervision of a nurse are available to workers during working hours

QUALITY CONTROL & INSPECTION DATA

CUSTOMER | PATTERN NO. | DATA

MOLD DATA			QUAL. CONTROL & INSPECTION	
NO. CASTINGS	CORES	CHILLS	ALLOY	SPEC.
FLASK SIZE	COPE	DRAG	CHEMICAL	PHYSICAL
RISER:	FULL	BLIND	ZYGLO	X-RAY
GATING:	COPE	DRAG	LAYOUT	BRINELL
GATE WEIGHT			HEAT TREATMENT	
PRODUCTION METHOD			SAND BLAST	WHEELABRATE
NO. MOLDERS			JIGS & ASSEMBLY	
CORE CARD NO.	CORE SAND MIX.			
			OTHER	

ORIGINAL SAMPLE REPORT

DATE MADE | DATE APPROVED

CHANGES: | DATE NEW APPROVAL

1.
2.
3.
4.

INSPECTION & GRINDING REMARKS

SCRAP DATA

DATE | TYPE OF SCRAP

FC 130-500-5-56

Complete record data are kept on every casting as part of the firm's quality control program

Box loads of castings are rolled from the grinding area conveyors to a cross conveyor. Pressure-tightness testing equipment is located at the end of this conveyor. Here, water meter, valve and other pressure-tight castings are tested under water with air at 100 psi. These and other castings are loaded into a second airless blast tumbling machine for cleaning with steel shot. Small castings are unloaded from this machine back into the tote boxes which roll down a curved roller conveyor to an inclined belt conveyor. Boxes go off the belt to a gravity roller conveyor in the shipping department. Men at benches along the conveyor inspect castings and segregate them into containers for shipment in trucks.

Larger bronze castings and those with exceptionally high inspection standards are unloaded from the blast machines to skids for movement by walkie truck to inspection tables opposite the grinding section. Here they are close to grinders for any required rework. Approved castings are transported by the walkie truck to the shipping department.

Aluminum castings are inspected along the cross roller conveyor and some are checked in jigs. Satisfactory castings are moved directly to shipping.

Castings requiring heat treatment are handled in two 1000-lb capacity pit type electric furnaces in the cleaning room. A gas-fired hot water quench tank is located between the furnaces.

Pattern Shop, Laboratory and Ventilation Facilities—The pattern shop is located off the coreroom and is equipped with standard wood and metalworking machines plus work benches. Patterns and permanent molds are repaired and gated. Majority of new patterns are purchased from outside pattern shops.

Metallurgical laboratory technicians perform chemical and physical analyses, Zyglo inspection, micro and macro etch and fracture tests, sand tests and x-ray interpretation. Samples of all incoming sand and metal shipments are tested. Core and molding sand mixes are checked every hour, but metal is checked every heat. Test bars are poured into sand molds from the middle of each heat.

As part of the company's quality control program, a record of molding, cleaning, inspection and scrap data is kept on every type of casting produced. One or more photographs to show gating methods for the castings forms part of the record.

All melting furnaces are exhaust hooded and fresh air is blown into the melting area through ducts in front of the furnaces. Exhaust from shakeout, sand cooling in the muller and from the under-floor conveyors passes through a wet collector. The sludge is returned to the molding sand to replace fines removed in processing and use. Pipes installed at all permanent machines in the cleaning room carry contaminants to a cyclone collector. The collected material periodically is hauled to a dump.

Brass Foundry Molding Practice

Mr. St. John's first article on molding is No. 18 in his series on *The Brass Foundry*. His subject here is green sand molding

By HARRY ST. JOHN
Foundry Consultant

MOLDING has become a rather complicated subject. In its traditional simple form it consists of packing moist sand against the face of a pattern to obtain a cavity having as closely as possible the exact shape and contours of the pattern.

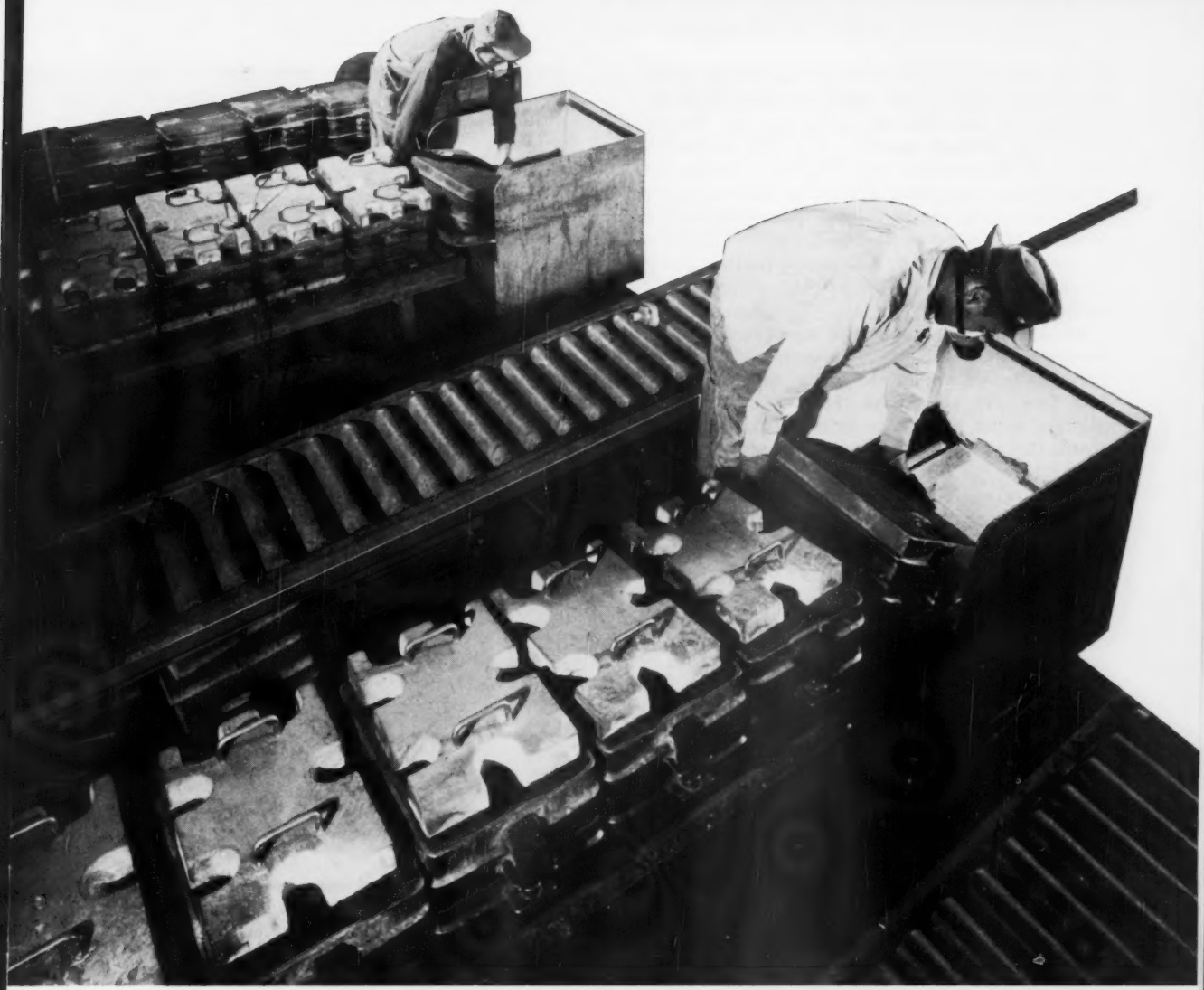
In the brass foundry this is still the usual molding method but there are several different ways of carrying it out. There are also several methods other than the use of moist sand as a mold material. The various methods, all of which have found at least limited use in nonferrous foundries, may be listed as follows:

1. Green sand molding. Clay or a claylike material is the bond; water is the tempering agent.
2. Dry sand molding. A green-sand mold is baked or a mold is made of baked cores having a sand base and a core oil bond.
3. The use of sand bonded with portland cement. It is similar in the making to that of a green sand mold but more like a dry sand mold when ready to pour.
4. The use of sand bonded and tempered with petroleum products or thermoplastic synthetic resins. The finished mold is plastic just as in green sand.
5. Shell molding. Sand bonded with a thermosetting synthetic resin is heated on the face of the pattern. The result is a thin nonplastic shell conforming to the contours of the pattern.
6. The carbon-dioxide process. A green sand mixture impregnated with sodium silicate is gassed with carbon dioxide after the mold has been formed. The result is a hard, nonplastic surface at the face of the mold.
7. Plaster molding. The mold is made of plaster of paris and baked.
8. Metal-mold casting. This includes both casting by gravity and pressure die casting. In gravity casting, semipermanent molds—utilizing artificial graphite, for example—sometimes are used.
9. Investment casting. A reverse pattern is used to make a form from wax or synthetic plastic and the mold is made around this form. The form is later melted or burned out. This is the so-called lost wax process.
10. Stack molding. Several molds are placed one on top of another and poured from a single sprue.
11. Centrifugal casting. The mold is rotated rapidly. Metal poured into a central opening or sprue is thrown outward by centrifugal force.

By far the largest proportion of brass and bronze castings is made in green sand, tempered with water. Some of the other methods mentioned are particularly applicable to certain special requirements, others are still in the development stage, their future uncertain. All have their advantages and their limitations. There is little probability that any of them will ever completely take the place of green-sand casting.

Regardless of the method used, it has become increasingly important that the molder confine his attention to molding. The days when a molder poured his own molds, and perhaps even shook them out, are past. The aim is to get the greatest possible production per dollar of invested capital and per man-hour of expensive labor. At the same time the molder has become a machine operator rather than a craftsman. Only in exceptional cases, usually on a small scale, is molding skill required.

Green Sand Molding—For small molds, snap flasks, slip flasks or solid flasks may be used to contain the mold. Solid flasks are constructed of metal—cast iron, malleable iron, steel or aluminum. Snap flasks and slip flasks may be of metal or wood. Snap and slip flasks are removed as soon as the mold has been completed, after which metal jackets or boxes are slipped around the molds to hold cope and drag in position until after pouring. An ancient practice, still in limited use, provides metal bands which are molded in place at the parting line when the mold is made, thus avoiding a need for jackets. If solid flasks are



It has become increasingly important that the molder confine his attention to molding. The days when he poured his own molds and perhaps even shook them out are past

used, a considerable number is required because they remain with the mold until after pouring. As the mold size increases, the use of solid flasks becomes general up to the limit of sizes commonly cast in brass or bronze.

Molds are made in a number of different ways. After the pattern has been covered with sand, which should be riddled to remove lumps and foreign materials, the flask is filled and the sand packed firmly into place. This may be done by hand ramming or by the use of an air hammer. However, with the exception of loose patterns or match work, small molds are usually made on a machine. In the jolt-squeeze machine the sand is compacted on the pattern face by mechanically bumping the assembly of pattern and sand-filled flask, after which the mold is further squeezed by air pressure applied to a squeeze head. Some machines jolt only; others squeeze only.

Molding Requirements—The object, of course, is to get a mold surface which will neither wash nor buckle when the metal strikes it, is strong enough to hold its shape and dimensions and yet permit the rapid escape of gases. The sand properties needed have been stated in a previous article (see FOUNDRY, December, 1956). Mold hardness can be measured by a tester designed for that purpose. With natural-bonded sands a hardness of 75 is about right. More accurate dimensions can be maintained with a bentonite-bonded sand at a mold hardness of 90 to 95. For this result an air-line pressure of 100 to 105 psi is needed. This will apply about 50 psi to the mold in the average small flask. In squeeze machines which do not jolt, the time of pressure application should be at least 5 seconds. A shorter time will give a noticeably softer mold.

The ordinary squeeze machine applies line pressure to a piston which, in turn, actuates the squeeze head, sized to fit the mold. If the area

of the piston is half the area of the squeeze head, the pressure per square inch of mold will be approximately half the line pressure. In the so-called high-pressure machine, a flexible diaphragm takes the place of the squeeze head, and the line pressure can be applied directly to the diaphragm. With a line pressure of 100 psi this would mean a pressure of 100 psi on the mold itself. No piston is required although by the use of a large piston actuating a small one the mold pressure can be multiplied indefinitely.

The flexible diaphragm also tends to follow the contours of the pattern, thus equalizing the mold hardness between high and low points on the pattern face. To accomplish this perfectly the diaphragm would need to be infinitely flexible which means that it would have to be infinitely thin. Unfortunately, the thinness of the diaphragm is limited by its ability to withstand the air pressure without rupturing. In small molds this requirement limits the effectiveness of the method. As the size of mold increases, the diaphragm principle works to greater advantage.

There are other ways of packing the sand against the pattern. If we can blow cores, why not blow molds? This has been tried, without too much success so far as green sand is concerned. The mixture of sand, clay and water is not sufficiently flowable and soft spots result. Even in oil-sand core mixes there is trouble if the water content exceeds 2 per cent. Throwing sand into the flask by means of a sandslinger is a more successful method which has become popular in the making of large molds. To a lesser degree it is also used for the rapid production of small molds.

Mechanics of Molding—The mechanics of molding vary from completely manual, as in the skillfully made mold with loose patterns, to completely automatic. A good deal depends upon the character of the pattern. For large castings, weighing 1000 lb or more, the skilled hand is still needed, but for the production of small castings, pattern pieces are mounted on plates and molds are machine made. Three pattern arrangements are possible, as illustrated in a previous article (see FOUNDRY, October, 1956).

For some reason not entirely clear to the writer the matchplate is by far the most popular pattern arrangement in brass foundries. Pattern pieces are mounted on opposite sides of a single plate, positioned in such a way that cope and drag portions of the castings will match exactly when the mold is closed. As a rule the drag is jolted, then inverted, the cope flask filled and the assembly of drag, pattern and cope is squeezed.

The combination cope-and-drag pattern has advantages over the matchplate both in pattern cost and in productive efficiency. In this arrangement the pattern pieces on the right side of the plate are matched with those on the left side. The plate, having one blank face, is mounted rigidly in the molding machine. Both cope and drag are made from the same pattern surface. For the same production only half as many pattern pieces are required as compared with the matchplate.

As yet, a truly satisfactory method of setting cores in molds mechanically has not been devised

Handling of the pattern between molds is eliminated.

It is occasionally desirable to use separate cope and drag patterns, which necessitate the use of two machines or a double machine. Or, as is sometimes done with medium-size production molds, a number of drags may be made from one pattern, then the pattern changed to produce an equal number of copes. Automatic molding is done with two machines which are synchronized so that cope and drag arrive at the closing position simultaneously. Varying degrees of automation may be employed, up to the point where pushbuttons take over and flasks and molds are untouched by human hands.

Before the mold is poured, weights of suitable size are placed on top of the mold to prevent the cope from lifting as a result of molten metal pressure. Sometimes it is sufficient to clamp the cope and drag together. The placing of weights must be done with considerable care to avoid crushing or shifting the mold.

Molding Accessories—At times various accessories are used in the making of green sand molds. Strainer cores and automatic sprue cutters have been described in previous articles on gating and risering. Chills, which may be of coated metal or

artificial graphite, are used to promote rapid setting of the metal at portions of a casting which are likely to be shut off from feed as the metal solidifies. Insulators, usually of gypsum plaster mixture, may be used to retard setting of the metal so that feed will continue through a thin section to a heavier section. In ferrous casting, chaplets, made of a metal more fusible than the metal of the casting, are sometimes used to support cores at points which cannot otherwise be supported. In brass and bronze, pouring temperatures are too low to insure sound metal at points where chaplets might be employed and their use is not recommended.

In the making of large castings, chills and insulators can often be used to advantage. For small castings, particularly where there are several in a mold, one cannot usually afford the increased molding cost which is out of all proportion to the benefits gained. Strainer cores are not so costly since there is only one to a mold.

Venting is another practice which adds to molding cost. Sometimes, however, it cannot be avoided if misruns and gas pockets are to be eliminated. On pattern plates, vents can often be made an integral part of the pattern. In large molds, high points can be vented through holes made by a thin rod, working from the inside out after the mold has been formed.

No really satisfactory method of setting cores mechanically has been devised. This remains a part of the molding craft which requires care and skill. When a job is started, the first mold should be inspected to make sure that the cores fit. If they are loose in the mold they will shift when the metal is poured. If the core prints are too small, the mold will crush.

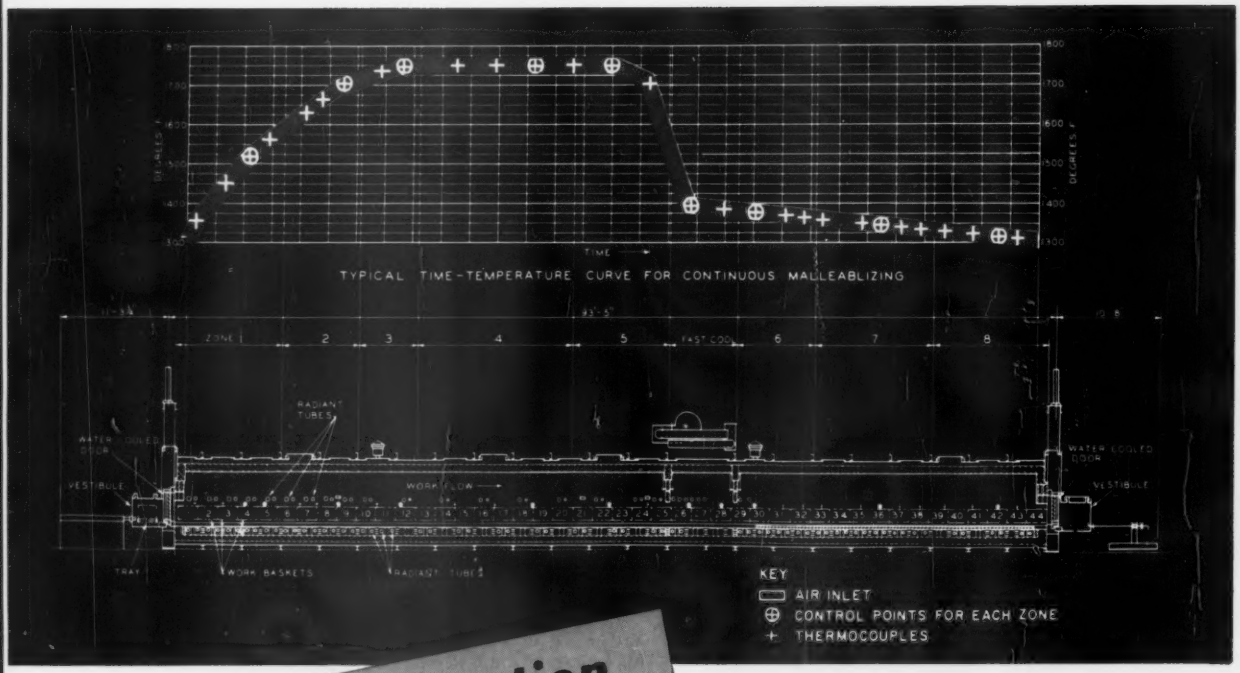
Green sand molding is more nearly universal in its application than any other method. It is cheap and exceedingly flexible. Anything except the most intricate and delicate shapes can be made in this way. Green sand molding is rapidly living down its reputation for crudity. Both fine finishes and close tolerances are obtainable if one takes advantage of recent developments in molding sand mixtures and molding techniques.

Dry Sand Molding—One limitation of green sand molding is the fact that the pattern must be withdrawn without disturbing any part of the mold. There must be sufficient draft and no undercuts. Sometimes this requirement does not conform with the ideas of the casting designer. The difficulty can be overcome by making the mold in whole or in part of baked sand cores which can be assembled to permit almost any desired deviation from the normal parting line between cope and drag. Such a mold is relatively costly and justified only when one complicated casting can thus be substituted for an assembly of castings. The cores must fit perfectly and, at best, one cannot expect the close tolerances attainable in an all green sand mold. Nor will the surface finish be of the finest quality.

The baking of green sand molds is not common practice in brass foundries. Intended primarily for large molds, its purpose is to strengthen the mold against the washing action of the metal. For the largest castings ordinarily made in nonferrous foundries it is sufficient to use a strong bentonite sand with especially hard ramming at critical points. Sometimes a refractory wash is used, baked with a torch or sprayed with gasoline and burned.

Stack Molding—Half molds made with drag on one face and cope on the other can be piled into a stack and supplied with metal through a common sprue. Thin, light castings, without cores, lend themselves best to this treatment. Green sand or baked oil-sand can be used. The writer has seen an installation where stacked molds are carried on a roller conveyor to a nose-tilting furnace which pours directly into the molds. To be sure, this particular installation is not nonferrous but there seems no reason why the same principle cannot be applied to brass, provided there is a continuous production of small rings, disks, levers and the like. The labor saving can be substantial.

While green sand molding is, and probably will continue to be, the most generally used molding method for brass and bronze, there are several other methods which are to be preferred for certain special applications. These have been mentioned at the beginning of this article and will be described next month.



Modernization Can Cut Costs in ANNEALING

Modernization of equipment means increased efficiency and reduced costs in any industry. This article describes the importance of modern heat treating equipment to the producers of malleable iron

LIKE other businessmen, all foundrymen inevitably run into the problem of whether to modernize their plants. The question probably seems particularly difficult in a period of high production, like the current one. Not only are returns from present plant good, but modernization is likely to be expensive. Actually, however, the choice lies only between the increased efficiency and reduced costs made possible by modernization and the ever increasing obsolescence that results from standing pat.

For malleable founders, the problem is particularly important in relation to their heat treating equipment. The purpose of this article is to analyze the benefits modern heat treating equipment offers producers of malleable iron. Let's begin with a brief resume of the reasons why heat treating is particularly important to these foundrymen.

Annealing Malleable Iron—In the malleable iron foundry, annealing refers to the process of graphitization by heat treatment whereby the combined carbon of hard iron is converted into temper graphite and iron in the distinctive form found in the malleable iron used in industry.

When first cast as white iron, the metal contains about 2.5 per cent carbon entirely in the combined form, so that the iron is extremely hard and brittle. For practical purposes, it is unusable. During heat treatment, this combined carbon is reduced gradually by a process of graphitization until, in the fully annealed state, it has very little if any combined carbon.

Standard Malleable Iron — The annealing of standard malleable iron is the basic heat treating operation in a malleable foundry. Length of the cycle depends on the chemical analysis of the iron. There are two grades, ASTM specifications 35018 and 32510, which may be made from iron of approximately the same analysis if the silicon content is not too high. Grade 35018 requires a longer annealing cycle and generally a little lower carbon content. Ordinarily, the lower the silicon content, the higher the carbon. The higher the

Fig. 1—Chart on facing page shows typical time-temperature curve for continuous malleabilization

silicon, the less time required to anneal a particular casting. Foundries which make a large variety of castings, including those with heavy sections, usually require lower silicon content than foundries which make small castings.

Pearlitic Malleable Iron—In addition to standard malleable, the other important type of malleable iron is pearlitic malleable. It contains some combined carbon and is used where increased strength, hardness and resistance to wear are required. Pearlitic malleable may be of a special analysis (high manganese) which requires a fairly long annealing cycle, or it can be made from iron of the same analysis as standard malleable iron.

When pearlitic malleable is made from the standard malleable analysis, the first stage of anneal is the same as that for standard malleable. The material usually is air quenched to 1000°F or under as fast as possible. It then is reheated to about 1550°F and quenched in oil. After the oil quench, the material is drawn on the basis of the results desired. In some instances, castings are removed from the line after air quench and are drawn to specific hardness requirements. The end product requirements determine which method can be employed.

Because of its hardenability, durability and ease of machining, pearlitic malleable iron has become increasingly popular in the automotive, farm equipment and road machinery industries. It is produced to ASTM specifications in which minimum requirements range from 65,000 to 100,000 psi tensile strength, from 45,000 to 80,000 psi yield strength and from 10 to 2 per cent elongation.

Types of Heat Treating Furnaces—Several types of furnaces can be used to anneal malleable iron. The type and size used for a given application depend on maximum production, the annealing cycle desired, method and efficiency of loading castings and variation in production rate. The three types of furnaces most used for heat treating in foundries are elevator, bell and continuous-type furnaces. Of the last, the roller-hearth and pusher-tray types are the most common.

Elevator furnaces are particularly suitable for annealing malleable iron castings. The cycle may be such that the high-temperature and low-temperature time requirements of the cycle are about the same. Two elevator furnaces normally are used—one for the high-temperature portion of the cycle and the other for the low-temperature portion. The low-temperature furnace can be provided with an auxiliary cooling system of alloy tubes in the top of the furnace to reduce the cooling time.

After the high-temperature portion of the cycle has been completed, the hot charge is transferred to the low-temperature furnace, where it is cooled and equalized at the temperature desired. It then is held at that temperature or slow cooled at a definite rate, as required.

Both continuous and bell-type furnaces are suitable for production of pearlitic malleable iron, for which oil quenching is used. The choice depends on local foundry production requirements.

For bell furnace operation the charge is loaded on grids and placed in the furnace with a crane. After the high-temperature treatment has been completed, the charge is removed from the furnace and placed in the quenching tanks with the same crane, then loaded into the low-temperature furnace for completion of the cycle.

With increased mechanization, the continuous furnace is coming into common use wherever foundries have the production to warrant it and the kind of product which lends itself to this type of annealing. Both the roller-hearth and pusher-tray furnaces commonly employ trays into which small batches of castings are loaded. These trays are conveyed continuously through the furnace by a driven table (as in the roller-hearth furnace) or by a pusher mechanism that shoves the charge forward one tray-length at a time.

Both furnaces are constructed along the same

MALLEABLE IRON

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Fig. 2—View of old-type malleabilization furnaces. Units of this type are being replaced by modern furnaces of the kinds described in this article

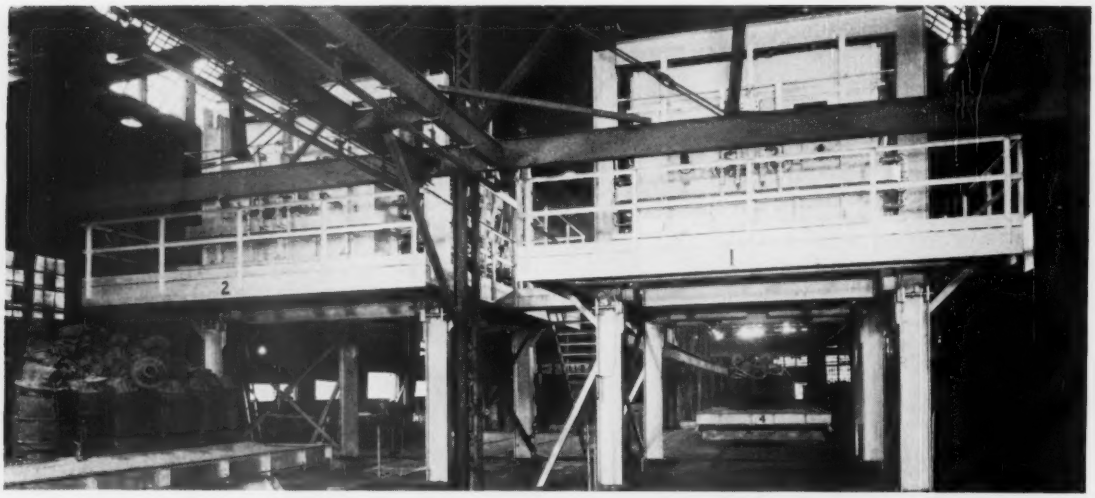
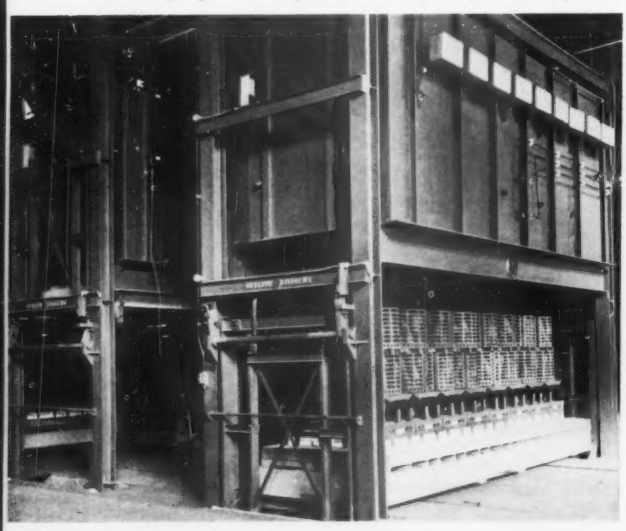


Fig. 3—Elevator-type furnaces like these are particularly suited for annealing malleable iron castings. They ordinarily are used in pairs

general lines and have five separate sections—an entrance vestibule, a high-temperature section for initial heating and holding, a fast-cool section, a slow-cool or low-temperature holding section and a discharge vestibule. Trays are loaded manually and then propelled forward to the high-temperature section for heating and holding. The first-stage annealing temperature may be from about 1750 to 1800°F, the more common temperature being 1750°F.

Although annealing cycles are greatly reduced at higher temperatures, anything above 1800°F usually is considered too high for commercial use because of the possibility of distorting the castings. The usual annealing time, if we assume a chemical analysis of 1 per cent silicon and 2.6 per cent carbon, is about 20 hours in each chamber, high and low-temperature, for a total of 40 hours.

Fig. 4—Compact design of two-unit malleable annealing system keeps floor clear for handling



Raising the silicon content to 1.35, in which case the carbon probably should be a little lower, permits reducing each stage to 15 hours, for a total of 30 hours.

In the second stage of the anneal, the charge first is fast cooled down to about 1400°F, then gradually cooled to about 1300°F. At all phases of the operation, the temperature must be closely controlled.

What Modernization Can Do—In general, there are 11 areas in which costs can be cut and casting quality improved by modern heat treating. They include the following: Shorter cycles, with substantial savings in fuel costs; time savings, or greater productivity; savings on containers used in heat treating; savings in floor space; improved working conditions and a cleaner plant; scale-free castings with improved machinability; better quality control and elimination of human error; increased flexibility; elimination of packing, with fuel savings as well as lowered materials cost; labor savings; savings in material handling costs.

Superiority of Modern Equipment—New, technologically advanced heat treating equipment is of paramount importance to foundries, furnace men declare. They state that foundries simply cannot afford to use old equipment just because it seemingly has many years of life in it. The precise process control made possible by modern equipment allows for a degree of quality control unobtainable with older equipment.

Control of temperature cycles is the key to successful modern heat treatment. These cycles must fully meet minimum heating and cooling time requirements for bringing about the intrametal reactions necessary for malleableizing without taking up excessive time in heating and cooling heavy pots and packing material. In addition, proper protective atmospheres prevent scaling of open-loaded work and permit the elimination of sand or oxide packing. In earlier operations, packing served the function of protecting material from

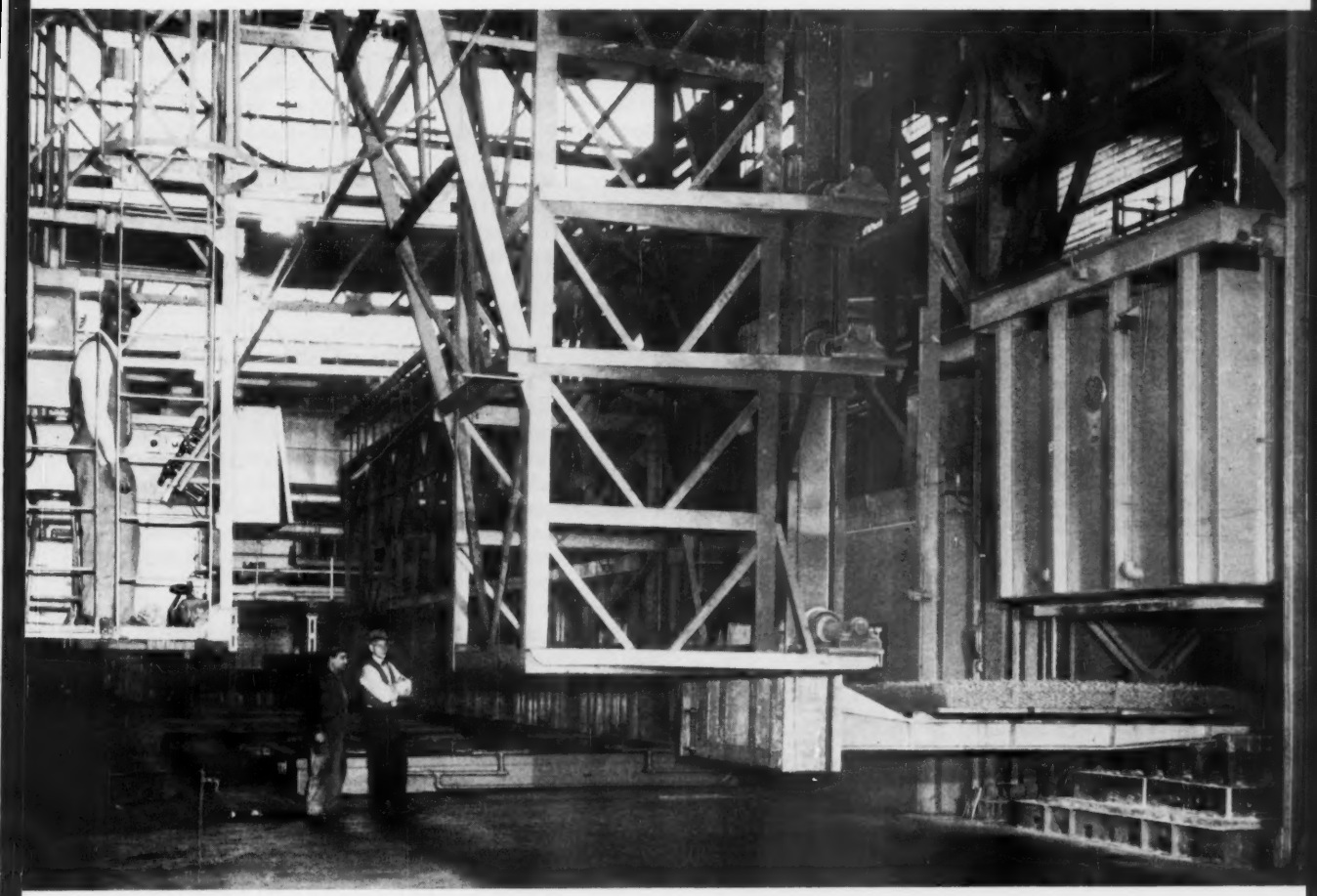


Fig. 5—Bell furnace installation for annealing of pearlitic malleable iron. Single crane, controlled by one man, loads, unloads and quenches 6-ton charge

scaling but at a high cost in lack of efficiency.

Furnace experts report that heat treating equipment now is able to deliver scale-free malleableized castings of certain types in commercial furnaces in 20 hours or less. That time contrasts with the 160 to 200 hours required in many older types of batch or pack furnaces.

Continuous malleable furnaces thus are designed today with three major engineering objectives in mind:

1. *Temperature Control*—Temperatures must be closely controlled throughout the length of the furnace. Also, temperature control must be such that every tray of work follows exactly a predetermined time-temperature pattern.

2. *Controlled Atmosphere*—Desirable to eliminate scaling and decarburizing of the outer surfaces.

3. *Flexibility*—If the basic temperature control arrangement and the design of the furnace are correct, considerable flexibility in production per hour is possible. Varying time cycles for white irons of different analysis and size are possible with modern furnace design.

How Modern Furnaces Work—In modern furnaces, products of combustion are prevented from contaminating the charge. In gas-type furnaces, radiant tubes are used almost exclusively for heating and are carefully sealed into the furnace casing to prevent leakage.

Independent zones of temperature control are set up along the length of the furnace chamber to provide the best heating, holding and cooling pattern for the malleableizing cycle, with special attention to accurate control of the critical slow-cooling section of the furnace. Control thermocouples are installed in each zone to regulate heat input or cooling air requirements. Automatic temperature controllers in the various zones insure the correct adjustments of fuel input anywhere along the line where the process may deviate from the desired time-temperature curve. Such modern control equipment takes the guesswork out of malleableizing.

"This new control equipment is wonderful," a superintendent of one of the larger commercial foundries recently told me. "We can set the time cycle by a responsible person such as a metallurgist or engineer and then lock up the controls. After that the process is automatic. No officious character who doesn't know what he is doing can louse up the works!"

Shortening the Annealing Cycle—Probably the primary advantage of modern heat treating equipment is that it offers the opportunity to shorten the annealing cycle and thereby greatly reduce over-all annealing costs. It has such additional advantages as decreasing the amount of money tied up in work in process and making it possible to fill customers' orders faster.

Here are some of the most effective ways of shortening the annealing cycle:

1. By more favorable chemical composition. Increasing the silicon content in the silicon-carbon ratio of the iron results in a faster anneal, decreasing the holding time required in both first and second stages of the anneal.

2. Installation of furnace equipment that permits close control over the time-temperature cycle and provides uniform heat distribution. Such furnaces with protective atmospheres permit the elimination of packing, heavy pots and other materials which require long times to become heated and correspondingly long times to be cooled. Old-style periodic furnaces have definite disadvantages in this respect.

Furnace Atmospheres—The matter of providing proper furnace atmospheres is of prime importance to every foundry processing any appreciable volume of work. Although this subject is sufficiently important for an entire paper to be devoted to it, only an outline of the basic principles can be attempted here.

Numerous chemical formulas have been developed as an aid in this field, but the basic approach is through a study of equilibrium data relating to the reduction and oxidation of ferrous materials.

There is no doubt that the diffusion of atmosphere gases into malleable castings during annealing has a great effect on the rate of anneal and the quality of the finished product.

The relationship of the constituent gases CO, CO_2, H_2 and N in the protective atmospheres has an important bearing on casting quality and annealing time. It is not the purpose of this paper to enter into a technical discussion of this subject except to say that much research has been carried on to determine the atmospheres that will yield optimum results.

Modern gas atmosphere generators afford a wide degree of adjustment that enables an operator to obtain the gas analysis that will best meet the over-all requirements. One requirement obviously is that the atmosphere prevent oxidation or scaling and limit decarburizing of the castings. The latter has an important bearing on machinability.

Trends in Foundry Heat Treating—In preparation for this article, the Industrial Heating Equipment Association surveyed member companies which manufacture foundry heat treating equipment and also questioned men from leading foundries throughout the country about trends in foundry heat treating. Some of their answers were challenging and should prove food for thought.

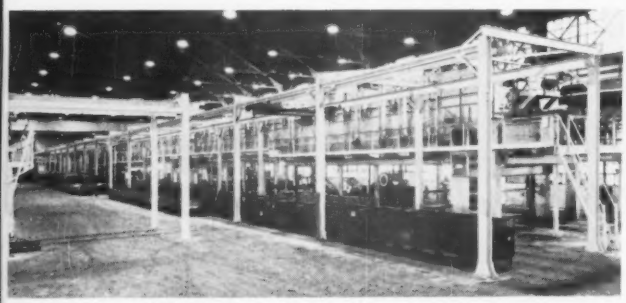
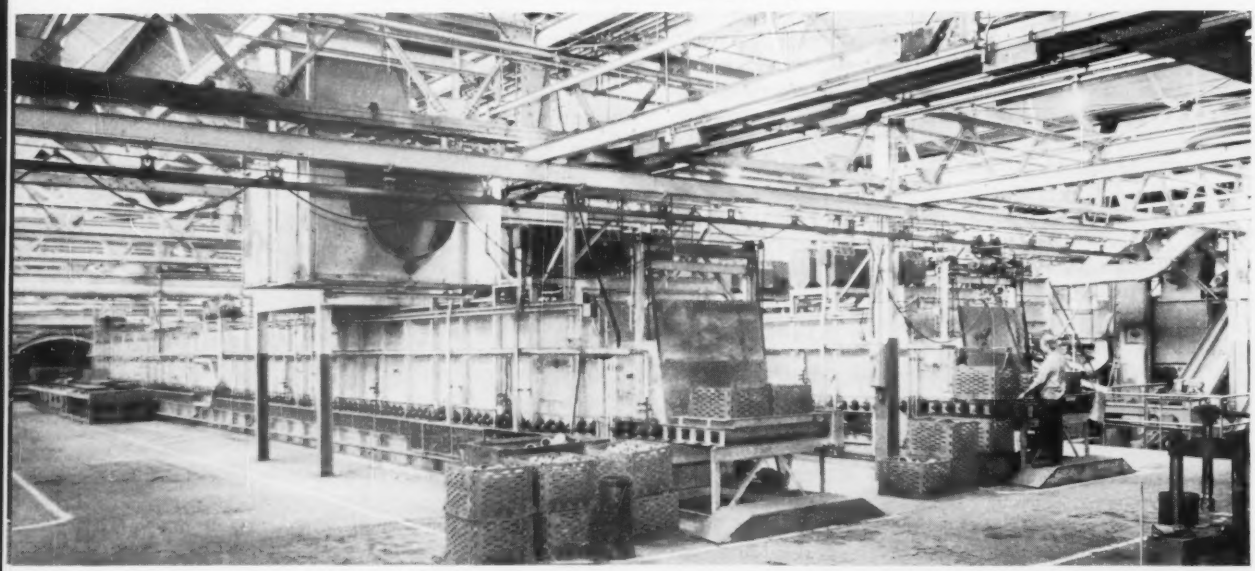


Fig. 6—Up-in-the-air, pusher-type malleable annealing furnace. Trays are returned automatically

Fig. 7—This pair of roller-hearth, continuous-type malleable annealing furnaces has a combined capacity of 32 tons of castings per day



Here are some things these well-informed people believe we'll be seeing soon:

1. *The swing to pearlitic malleable*: "Even though only about 15 per cent of the total output now is pearlitic malleable as compared with standard malleable, I'd bet my right arm that pearlitic malleable will account for 75 per cent of the tonnage ten years from now!"

That was the comment of one furnace man who specializes in handling the heat treating problems of malleable foundries. It was echoed with surprising unanimity by furnace men and foundrymen alike.

2. *The completely automatic line will come soon*: One major furnace company reports that it is putting the final touches on plans for a completely automatic line which is expected to be in operation in a big foundry this year.

The trend toward automatic operation continues to accelerate. The dividing line where such mechanization begins to pay off is at about 750 tons of production per month, furnace men declare. Above that, it pays to mechanize and the future will see larger foundries taking advantage of the opportunities for saving labor. As wage rates go up, the percentage of labor in the finished product will go down, they predict. Below 750 tons per month, foundry heat treating will continue to be largely a batch-type operation, they say.

3. *Melting practices of foundries, in controlling elements which retard the anneal are improving and will have to improve more to meet customer demands for better physical properties of end products*: "At times some of the metal foundries turn out just can't be annealed on a short cycle," stated a furnace man. "The melting practices of the leading foundries are pretty good, but a lot of 'em turn out iron that is extremely difficult to heat treat right. They are improving, though, and we expect a lot more improvement in the future. The situation also is improved by the fact that more and more foundries have at least one metallurgist on their staff."

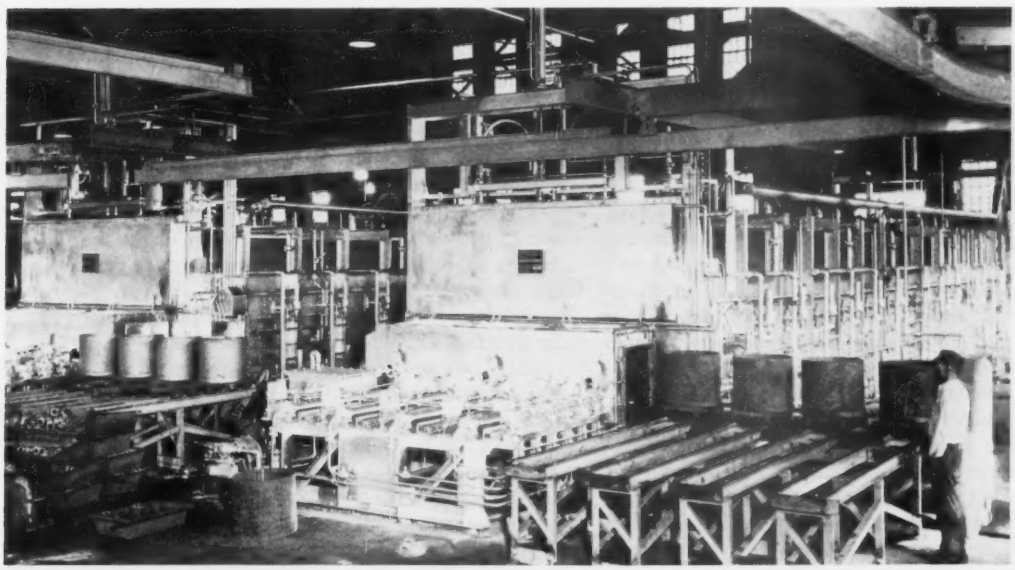
4. *Foundries can effect savings and improve working conditions at the same time*—"What used to be the dirtiest place to work in our plant now is the cleanest," one foundryman remarked. "That places us in a position to attract and hold a better class of workers, and all employees work more efficiently." Ash from pulverized coal firing of ovens is eliminated, along with sand or slag previously used as packing material for castings during anneal. With competition keen for the engineers and metallurgists the industry requires, the foundry with modern, clean and controlled annealing operations is in a better position to attract and hold the interest of such personnel.

Case Histories Show Cost Savings—An outstanding study in what can be done by the use of modern equipment is shown by the experience of National Malleable and Steel Castings Co. At its Cleveland works, this company, by replacing old periodic furnaces with new furnaces, cut its annealing cycle from 144 hours to 48 and cut the man - hours needed in the process by 50 per cent.

The installation was put in as a "package," with material handling equipment such as cranes engineered right into the over-all setup. Floor space required was reduced greatly and flexibility increased. Two men, on each of three shifts, now can anneal 30,000 tons per year—a feat unheard of with old-style equipment.

Another outstanding installation is that of General Metals Corp. at Vernon, Calif. The annealing cycle for malleable iron in this installation was reduced from 84 hours to 32. In addition, only one-half the floor space necessary with the old-style equipment is required. Costs were cut considerably by eliminating packing, shaking out, cleaning and tooling operations.

Fig. 8—Illustration shows a typical kind of modern, atmosphere furnace for annealing malleable iron. Unit is of continuous, multiple-row pusher type



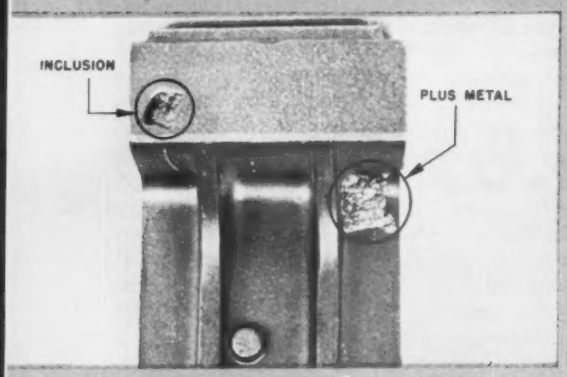


Fig. 1—Dip coat spalling

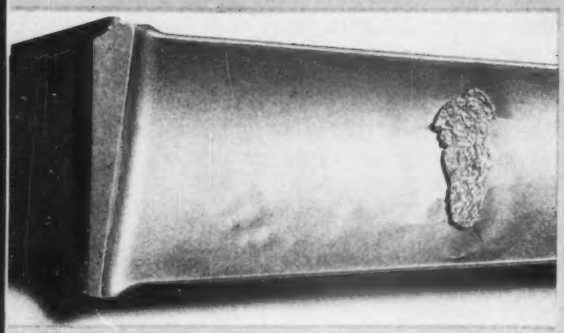


Fig. 2—Dip coat buckling

Things To Watch In Producing . .

SOUND INVESTMENT CASTINGS

The author diagnoses causes of defects normally found by visual inspection and suggests proper remedies. This paper was presented at a seminar of the Investment Casting Institute at University of Michigan

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ALTHOUGH many different types of defects may develop in the production of investment castings, this discussion will be confined to those defects normally found by visual inspection of the rough castings.

In most cases, scrap problems are best solved through application of common sense and trial and error. For example, a good foreman in the wax department will work out the problems of injection pressure, temperature, etc., to correct conditions which may cause scrap patterns. Such problems never should come to the attention of the quality control department.

In diagnosing the various casting defects and recommending their remedies, the writer has related them to the experiences encountered at Misco Precision Casting Co. Our practice consists of dip coating the cluster in a conventional manner and then making a monolithic mold by filling with an investment back-up. Ethyl silicate is used as a binder for this investment, and electromagnetic vibration is used to pack it down. Indirect arc electric melting furnaces with magnesite crucibles are used for the casting operation.

All of the foregoing factors should be kept in mind in relation to the following discussion of defect causes and their correction.

Dip Coat Spalling—(Fig. 1)

Symptoms—This condition is readily identified by evidence of plus metal at sharp corners of the casting, accompanied by inclusions in other areas which are roughly of the same shape. Frequently the fine dip coat flour can be identified in the inclusions.

Cause—Dip coat accumulates in critical areas and builds up into thick layer of fine flour. Stucco sand does not penetrate this thick layer far enough to provide a mechanical bond which could hold the

dip coat securely to the investment back-up.

Remedies—

1. Change dip coat viscosity to a thinner consistency.

2. Operator should use more care in draining dip coat so that film is distributed more evenly.

3. Use coarser stucco for deeper penetration into dip coat film.

4. Strengthen dip coat film by adding compatible binders or gelatizing agents.

Dip Coat Buckling—(Fig. 2)

Symptoms—Cracks on surface of casting which are part of an area which indents into the casting. Dimensional deformation is evident in these areas as a bulge and often is accompanied by a metal skin overlapping the dip coat. Buckling of a lesser degree is also often noted in the form of a dimpled surface condition—many small bulges or indents over a large area of casting surface.

Cause—Differential expansion between dip coat and investment back-up will cause dip coat to buckle inward toward cavity. Also poor packing of investment will cause buckling and dimple condition on casting surface. Lack of investment packing on underside of pattern will result in investment voids into which the dip coat will collapse.

Remedies—

1. Check thermal expansion characteristics of investment as related to dip coat and design both for most suitable compatibility.

2. Check gel control of investment operation and maintain proper gel conditions for best packing of investment.

3. Double dip areas of weakness in order to strengthen dip coat and prevent break-through as metal enters mold.

4. Use coarse-grained, sharp stucco material to increase mechanical bond between investment back-up and dip coat.

Excess Metal Bubbles—(Fig. 3)

Symptoms—Small spherical bubbles of excess metal in sharp corners, grooves, holes, and other similar recessed areas on castings.

Cause—Dip coat film flowing over corner of grooves so as to envelope the pocket of air in such critical areas.

Remedies—

1. Use very thin slurry dip coat as a preliminary wetting dip. Agitate and swirl cluster to allow escape of trapped air in this thin slurry. Then dip cluster into heavier slurry of desired consistency.

2. Train operator to use light blast of air to blow dip coat film on cluster as it drains. This action moves dip coat film in critical areas and allows trapped air to escape.

Investment Trapped Liquid or Air—(Fig. 4)

Symptoms—Dip coat buckling on underside areas of castings where investment cannot pack down during vibration. The metal break-through in such areas usually is a lace type network encased in silica deposit from the ethyl silicate gel.

Cause—Pattern surfaces perpendicular to direction of packing catch the excess liquid or air rising from investment as it packs down during vibration. This excess liquid (sometimes air also) condenses to a much reduced volume of silica gel which leaves a void on the underside of the dip coat.

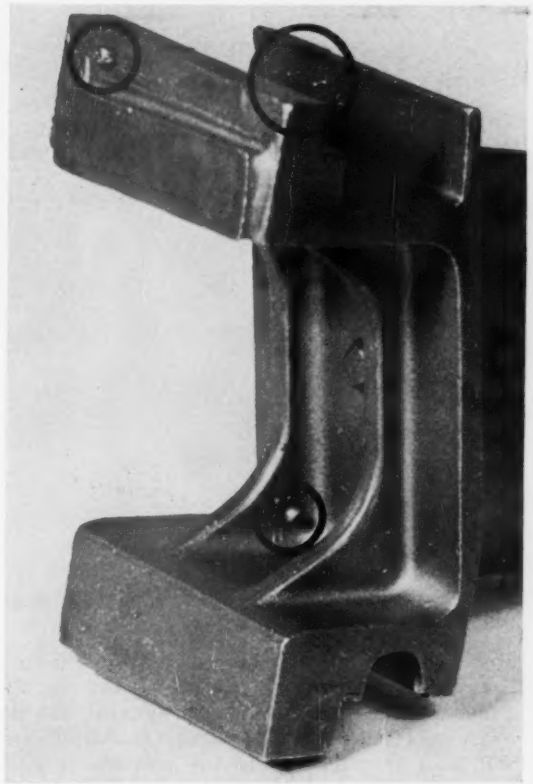


Fig. 3—Excess metal bubbles

Remedies—

1. Double dip troublesome areas to increase strength of dip coat.

2. Slow down packing time of investment to permit such liquids to work their way up. Packing can be slowed by increasing fines or decreasing gel time of binder.

3. Pre-invest trouble areas in inverted position to get maximum strength for such weak spots. (This is quite tricky and must be done with great care.)

Core Shift or Core Failure

Symptoms—

1. Metal in hollow sections of castings.

2. Ceramic section of core exposed on surface of casting.

3. Part of core breaking off and falling to some other area of cavity.

4. Metal flash through crack across core at either end of hollow section of casting.

5. Dimensional deformation resulting in thin wall in cored sections.

Cause—

1. Weak investment in core section due to improper packing.

2. Metal flow into cavity sometimes is directed more against one side of a core than the other.

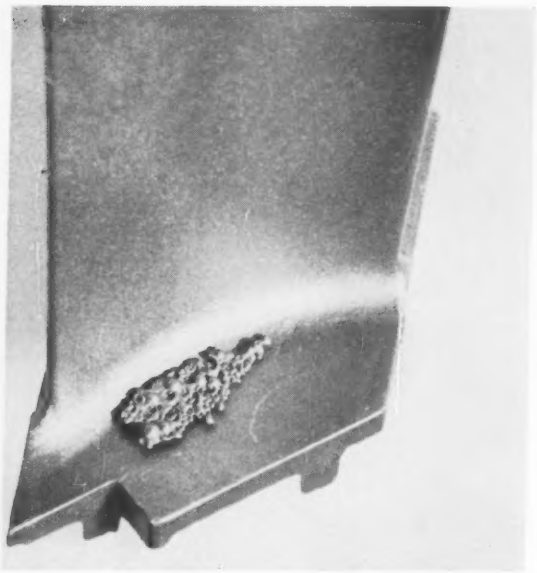


Fig. 4—Investment trapped liquid

This can cause stresses which will distort the core.

3. Residual stresses in injected patterns will cause distortion when relieved by heat for dewaxing operation. Weak or brittle investment cores will bend or crack due to the pressure of these stresses. Hollow plastic patterns are the most difficult to work with in this regard.

Remedies—

1. Dip coat on cored sections must be thin enough so that core opening is as large as possible to permit easy and efficient packing of the investment into the core section.

2. Increase the ratio of fines in the investment blend to slow down the packing and permit good flow into the core sections.

3. Redesign gating so that metal enters casting cavity equally on both sides of core.

4. Change pattern injection operation so that residual stresses are reduced to a minimum.

Binder Penetration—(Fig. 5)

Symptoms—Swirl pattern of roughness on surface of castings. Usually located on flat surfaces of castings or sprues and runner bars.

Cause—Binder penetrates through dip coat pores or through crack in dip coat layer. This liquid then condenses to silica gel leaving a deposit which causes surface roughness.

Remedies—

1. Control temperature of dip coat and investing areas to prevent thermal change of pattern material after dip coat operation. Such thermal changes cause dip coat to crack or bulge, thus allowing binder to penetrate as a liquid deposit next to pattern.

2. Control humidity at dip coat station to prevent excessive drying of dip coat film. Extremely dry dip coat means that thousands of pores are empty and permit binder to penetrate through to pattern during investing operation. The same porous openings when filled with moisture minimize this penetration.

3. Check to see that dip coat adheres to pattern. Grease, excess soap, silicones, etc. are sometimes used as wax injection lubricants and can prevent good adherence of dip coat to pattern.

4. Check to see that temperature of investment slurry is close to that of dip coat operation. Sudden changes in temperature at any point between dip and investing operation can cause this trouble.

Dirt Inclusions

Symptoms—Small scattered pits throughout casting which are not readily identifiable or related to any specific scrap cause.

Cause—Check all conditions which can cause scrap of this nature. Usually these small pits are a lesser degree of the troubles noted above—namely, binder penetration, spalling, buckling, mold cracks, slag, and careless handling of molds.

Remedies—

Fig. 5—Binder penetration

1. Evaluate symptoms to causes as noted above.

2. Check operations from mold preheat through casting to determine if careless handling or rough treatment is causing dirt to fall into cavity.

Slag Inclusions

Symptoms—Surface cavities filled with slag material which can be easily identified by its glassy or cinder-like substance.

Cause—Slag on surface of molten metal entering cavity and becoming trapped in casting.

Remedies—

1. Work with raw material vendor to improve quality of shot or remelt stock to minimize slag or scum formation.

2. Use deoxidant additions to react with and reduce slag layer on molten metal. Such material as calcium silicon, calcium manganese, silicon, calcium, aluminum, ferrosilicon and others have been used for deoxidants on various metals.

3. Skim surface of molten metal when possible to remove slag before pouring.

4. Slow rollover rate where possible to prevent turbulence which may allow slag to rush into mold with molten metal.

5. Check refractory quality of melting crucible to minimize slag contamination from this source.

6. Check casting methods to assure control of operation with respect to temperature, cleanliness of furnace throat after each pour, and other such conditions.

7. Check refractory quality of mold. Some metals react with silica dip coat to form glassy slag. If this is diagnosed, a lower pouring temperature must be used or a more refractory dip coat must be developed.

8. Use protective atmosphere during melt to prevent oxidation of metal to form slag. Argon is most generally used for such atmosphere.

Scabbing or Surface Pitting

Symptoms—Many isolated areas of slag-like pits widely dispersed over casting surface. Very shallow and most usually found on iron-base alloys.

Cause—One theory is that as the metal leaves the melting furnace it rains into the cavity. Such droplets become oxidized on the surface and then as they come into contact with the dip coat, a reaction occurs between this iron oxide film and the silica dip coat. This leaves a slag-type pit on the casting surface.

Remedies—

1. Use trichlorethylene (halogenated hydrocarbon) as a liquid additive to the hot mold just before pouring. This fills cavity with fumes which prevent oxidation of droplets. Caution: Care must be used because such fumes are toxic and also because an excess in the cavity can cause gas blowholes and back pressure to prevent proper fillout.

2. Develop dip coat formula which will be more refractory than silica. Alumina and zircon are two possible materials for this application.

Gas Defects—(Fig. 6)

Symptoms—Blowholes in castings, incomplete fillout of cavity, small surface craters, or internal holes which are detected by x-ray examination.

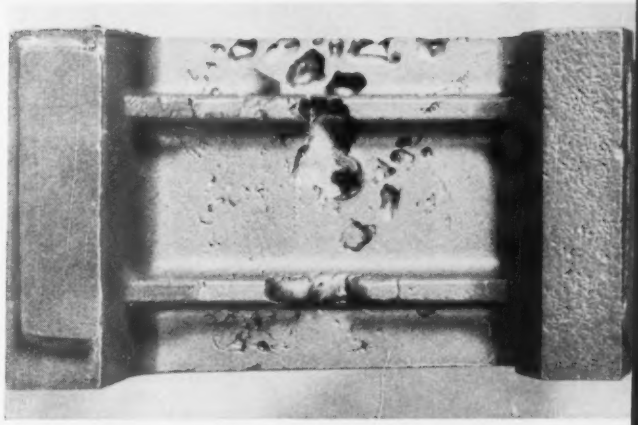


Fig. 6—Gas defects

Cause—

1. Incomplete burn-out of mold during preheat operation leaving carbonaceous residue from wax. This residue decomposes when heated by molten metal, thus evolving gases which bubble into casting.

2. Cavity gas trapped by molten metal because permeability of mold is too low or metal is too cold to permit gas to bubble out.

3. Certain alloys are prone to absorb gases during melting operation and then evolve them as they solidify after being poured into mold.

Remedies—

1. Improve burn-out conditions of preheat furnace by increasing oxidizing characteristics of muffle gases or increasing preheat time.

2. Vent cavity by proper wax assembly design to facilitate maximum removal of wax, and allow cavity gas to be expelled as the metal enters. Also check conditions which might cause variation in mold permeability (such as binder penetration). Evaluate possible benefits by increasing metal temperature.

3. On alloys which are prone to absorb gases during melt, check methods of operation to assure

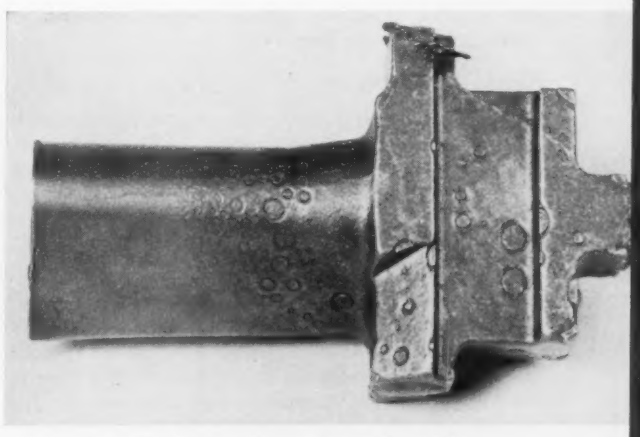


Fig. 7—Hot metal reaction with mold

Fig. 8—Oxide fold

complete control. Do not overheat or hold at temperature longer than necessary.

Hot Metal Reaction with Mold—(Fig. 7)

Symptoms—Eroded surface on casting in form of small ring-type slag pits. Sharp corners rounded off as metal washes away ceramic part of mold. Excessive pitting on casting surface. (Very similar to scabbing as described above.)

Cause—Certain alloys react with silica-type dip coat, causing erosion of cavity wall and accumulation of slag pits in casting surface. Nickel-base alloys react at lowest temperatures. Cobalt-base alloys also show similar symptoms at higher temperature.

Remedies—

1. Maintain proper temperature control on melting operation. Specify temperature for alloy desired which will be low enough to prevent reaction.
2. Develop more refractory mold materials. Use of alumina or zircon shows greatest promise as remedy for this problem.

Oxide Fold—(Fig. 8)

Symptoms—Stringer-type layers of oxidized metal folded over itself to cause a lamination in the casting. This condition varies from an almost undetectable flaw (found only by Zyglo inspection) to the gross type of defect which allows layers of surface metal to be peeled from the casting.

Cause—Certain alloys will form oxide layers or scum as they melt. This is either an indication of the presence of an oxidizing atmosphere during melting or the presence of an excess of oxides in the remelt stock. Normally, this film will be dissolved into the molten metal as the temperature increases. On subsequent cooling, however, the film is again formed as a scum precipitated from solution. Our theory is that this scum formation occurs as the metal is chilled in its path into the cavity. Nickel-base alloys are most troublesome in this regard.

Remedies—I wish I knew a good cure for this problem! However, the following opinions are suggested.

1. Increase metal temperature. Caution—nickel-base alloys react with silica dip coat at elevated temperatures.
2. Check raw material chemical composition and evaluate changes which will minimize presence of oxides in the raw material stock.
3. Evaluate benefits in using alumina or zircon mold materials with higher metal temperature.
4. Evaluate addition of special deoxidants such as calcium, calcium silicon, etc., to reduce scum.

Fig. 9—Misrun casting

Shrink Conditions

Symptoms—Open porosity or holes in the body of the casting exposed either to the surface, or by sprue cut-off, or detected by x-ray. Center line shrink is often noticed in castings on x-ray examination only.

Cause—Lack of molten metal feed to point of final solidification in the casting.

Remedies—

1. Evaluate thermal effect on solidification and

temperature gradient in casting by varying the mold preheat temperature and the metal pouring temperature.

2. If temperature controls fail to correct shrink condition, a complete study should be made of the feeding effect of sprues, risers, runners, etc., in the casting cluster arrangement. Keep in mind that the largest individual masses within the casting should each be fed by runners or risers of larger mass and higher metal temperature.

3. Evaluate effect of using exothermic-type hot-top compounds on sprues and risers to increase feeding characteristics.

Misrun or Cold Shut—(Fig. 9)

Symptoms—Casting not complete, rounded-off edge indicating lack of fill-out in cavity. Cold shuts often found in form of metal folding over itself and not fusing together as a common mass. Sometimes cold shuts are also evident in the form of small pellet-like metal particles completely imbedded in an otherwise perfect casting.

Cause—

1. Cold metal freezes before fill-out of cavity can be accomplished. Some alloys, being less fluid than others, are more troublesome.

2. Excess cavity gas can cause back pressure to prevent complete metal flow into cavity.

3. Cold particles of metal in furnace throat can fall into cavity and then be surrounded by molten metal but not completely fused. This generally occurs at thin edge of casting in areas of smaller mass and can also be traced to raining effect of metal into mold cavity during rollover operation.

Remedies—

1. Evaluate metal pouring temperature and mold preheat conditions.

2. Use air pressure if possible to force metal into cavity extremities.

3. Increase fluidity of metal with alloy additions.

4. Check for incomplete burn-out of organic matter in mold or other possible sources of trapped cavity gas. Mold permeability variation can also be a cause of this trouble.

5. Cold shuts (pellet type) can be reduced by evaluating rollover technique to minimize metal spray into cavity and also by training operators to keep furnace throat clear of all metal particles.

Mold Crack—(Fig. 10)

Symptoms—Heavy flash across casting cluster indicating cracks occurred in mold.

Cause—

1. Expansion of wax within mold during initial heating.

2. Difference in thermal expansion between dip coat and investment.

3. Lack of sufficient investment material between cavity and mold wall.

4. Improper packing of investment materials in mold may cause weaknesses that will generate into cracks. Excess of fines or supernatant ethyl silicate binder in layers.

5. Poor investing techniques—such as waiting periods during filling of mold can cause laminations that develop into cracks.

6. Poor wax cluster design can result in a plane of weakness across the mold section that sometimes develop into cracks.

Remedies—

1. Rapid heating of mold during dewaxing cycle is better. This apparently burns wax out before sufficient expansion takes place.

2. Wax burn-out of the mold during the period of 4-8 hours following investing has been found to be most advantageous. Apparently the molds are less brittle at this point and will stand more stress.

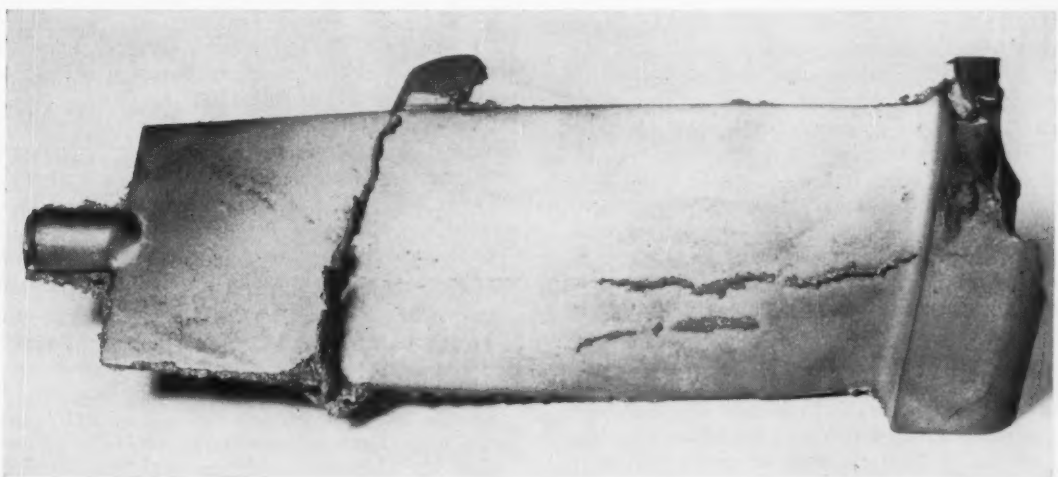
3. Store invested molds in uniform temperature.

4. Check flask mounting operation to assure sufficient mold material around cluster.

5. Check investing operations to assure use of proper techniques.

6. Check cluster design for planes of weakness and correct by staggering runner bars and patterns, etc.

Fig. 10—Mold crack



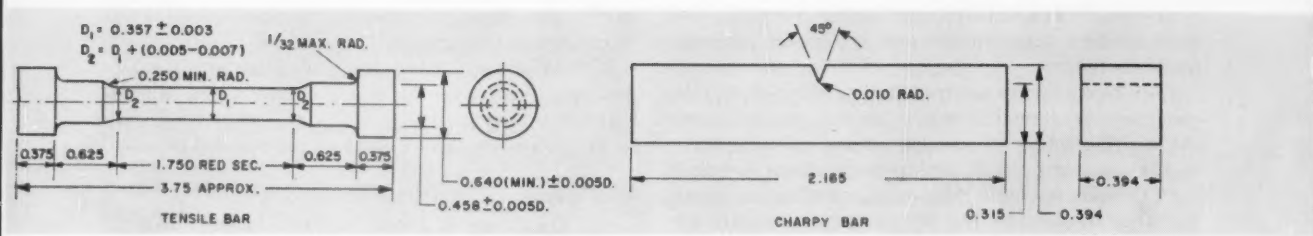


Fig. 1—Diagrams illustrate dimensions of, left, the tensile specimens and, right, the impact specimens employed in this investigation

Effect of Cerium on Mechanical Properties of a Cast Titanium Alloy

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GRAIN size is known to influence the properties of many metals and alloys. Generally, smaller grain size material has more desirable mechanical properties. This phenomenon usually is true also for titanium alloys. Ogden, Holden, and Jaffe[1] have shown that increasing the beta grain size reduces ductility. In view of the beneficial effects of smaller grain size, many elements have been studied to determine their beta grain refining characteristics in titanium alloys.

It has been found that the addition of cerium or thorium will refine the cast beta grain size of titanium and several titanium alloys. However, the addition of thorium does not affect the mechanical properties[2]. In an investigation by Taylor on the titanium-cerium system, it was found that cerium additions reduce the cast grain size of three commercial titanium alloys[3]. The alloys studied in Taylor's investigation were an 8 per cent manganese alloy, a 1.3 per cent iron-2.7 per cent chromium alloy, and a 4 per cent aluminum-4 per cent manganese alloy. However, the mechanical properties of these alloys, with cerium additions, were not determined. Since Taylor's work, a titanium alloy containing 6 per cent aluminum and 4 per cent vanadium has come into commercial prominence. This alloy has a wide range of mechanical properties which can be produced by varying heat treatments.[4]

In view of the desirable properties of a titanium-6 per cent aluminum-4 per cent vanadium alloy and the results of Taylor's work on grain refining, it was felt that the effect of cerium additions on this alloy warranted investigation.

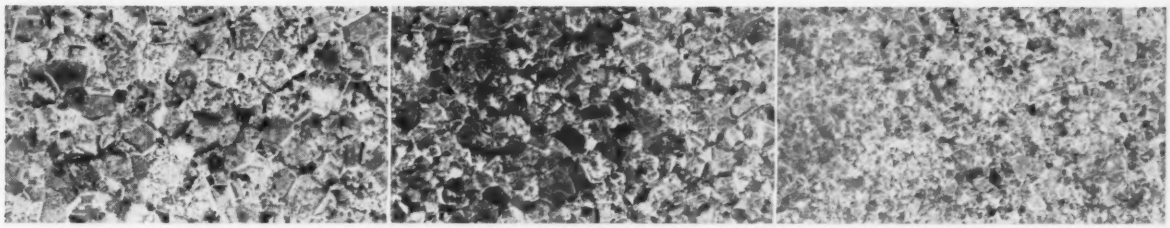
Alloy Fabrication—The alloys used in this investigation were made by the non-consumable electrode process in an argon-helium atmosphere. The alloys were initially made in the form of pigs. Several of these pigs were then loaded into a large bottom-pour furnace, where they were arc melted and cast into plates. The dimensions of the final castings were 6 x 6 x ¾ in. Machined graphite was used as the mold material. Complete melting and casting techniques are outlined in previous reports[5, 6]. All of the alloys were made from DuPont Process A titanium sponge, commercially pure aluminum (99.54 per cent Al), vanadium (99.6 per cent V) and cerium (greater than 98 per cent Ce). The titanium sponge used had a base hardness of 110 Bhn (3000 kg load).

The alloys investigated had a nominal composition of 6 per cent aluminum, 4 per cent vanadium with varying amounts of cerium (from 0 to 0.42 per cent Ce). The chemical analyses for the alloys studied are shown in Table I.

Heat Treatments—Two separate heat treatments were used. The first, which will be designated as

TABLE I—Chemical Composition of Alloys

Heat No.	% Al	% V	% Ce	% C
0	6.04	3.87	0.0	0.08
3	5.88	3.77	0.13	0.05
5	5.88	3.87	0.34	0.08
1	5.82	3.59	0.42	0.09



No Ce added | 0.24% Ce added | 0.57% Ce added

Fig. 2—Effect of cerium additions on cast grain size of titanium—6 per cent aluminum—4 per cent vanadium alloy. Etchant: 1 ml HF, 9 ml H_2O. 2X

The investigation described here was to determine the effect of cerium additions on the cast grain size and mechanical properties of a 6 per cent aluminum-4 per cent vanadium-titanium alloy. Cerium additions reduced the cast grain size of the alloy, with an accompanying loss in ductility and strength. This loss in strength and ductility was caused by the presence of a cerium rich phase at the grain boundaries.

"A," was used to provide high strength with good ductility. This heat treatment involved holding the specimens at 1400°F for one-half hour, and then water quenching. These specimens were reheated to 1100°F and held at temperature for 8 hours and cooled in the cold chamber of the furnace. The second heat treatment, which will be called "B," was used to provide higher strength with somewhat lower ductility. These specimens were held at 1700°F for one-half hour and water quenched. They were reheated to 900°F for two hours and cooled in the cold chamber of the furnace.

All the heat treatments were carried out in vacuum of approximately one micron. The temperatures were controlled to plus or minus 5°F during the cycle. Not more than 15 seconds elapsed from the time the vacuum was released until the specimens were quenched. The specimens cooled in the cold chamber of the vacuum furnace cooled slightly faster than they would have in air.

No appreciable change in grain size, due to these heat treatments, was observed for this alloy.

Metallography—Cast blocks of titanium-6 per cent aluminum-4 per cent vanadium alloys containing 0.0, 0.24, and 0.57 per cent cerium were hand-polished and macroetched with a solution of HF. Photomacrographs of these specimens are shown in Fig. 2. The fact that cerium additions reduce the cast grain size of this alloy is evident from this figure.

The specimens under study were mounted in bakelite and hand-polished down through 3/0 paper. The final polish was accomplished electrolytically. The electrolyte consisted of 1 part (by volume) water, 2 parts perchloric acid, 23 parts ethyl alcohol, and 21 parts ethylene glycol. The specimens were swab etched for 45 seconds with Keller's etch (1.0 ml HF, 1.5 ml HCl, 2.5 ml HNO_3, and 95 ml H_2O). Photomicrographs of the alloys used in this investigation are shown in Fig. 3.

Mechanical Properties—In general, the addition of cerium to a titanium-6 per cent aluminum-4 per cent vanadium alloy caused a reduction in tensile strength, ductility, and impact resistance both in the cast and the heat-treated conditions.

Cast Properties—The results of tensile tests on specimens containing 0.0, 0.13, 0.34, and 0.42 per cent cerium indicated that cerium had very little effect on the tensile and yield strengths of a Ti-6Al-4V cast alloy. The trend of this effect was a slight decrease in both the ultimate and yield strengths. The ultimate strength was in the range of 130,000 to 134,000 psi for all the alloys. The yield strength varied from 121,000 to 118,000 psi (Fig. 4).

The plot of elongation versus cerium content shows that cerium does have a detrimental effect on the elongation. Over the cerium range studied (0.0-0.42), the elongation decreased from 6.5 to 2.5 per cent. Similarly, a large reduction in impact strength was observed as the cerium content was increased (Fig. 5). The cast alloy having no cerium had an impact strength of about 30 ft-lb. When 0.13 per cent cerium was added, the impact strength decreased to about 10 ft-lb. The addition of 0.34 and 0.42 per cent cerium caused a further reduction in impact strength to about 5 ft-lb.

No major variation in hardness (DPH, 10 kg Load) was found with respect to cerium content for the cast alloys.

Heat Treated Properties—Tensile test results for specimens given the "A" heat treatment indicated that the addition of cerium has a markedly detrimental effect on the tensile properties of the alloy. The ultimate tensile strength decreased from approximately 132,000 psi for the alloy containing no cerium, to 90,000 psi for the alloy containing 0.42 per cent cerium. Alloys that contained 0.34 and 0.42 per cent cerium were so brittle that the yield strengths could not be determined. The elongation decreased from 7.1 to 1.3 per cent as the cerium content was increased from 0 to 0.42 per cent.

The impact curve for the "A" heat-treated specimens, as a function of cerium content, is practical-

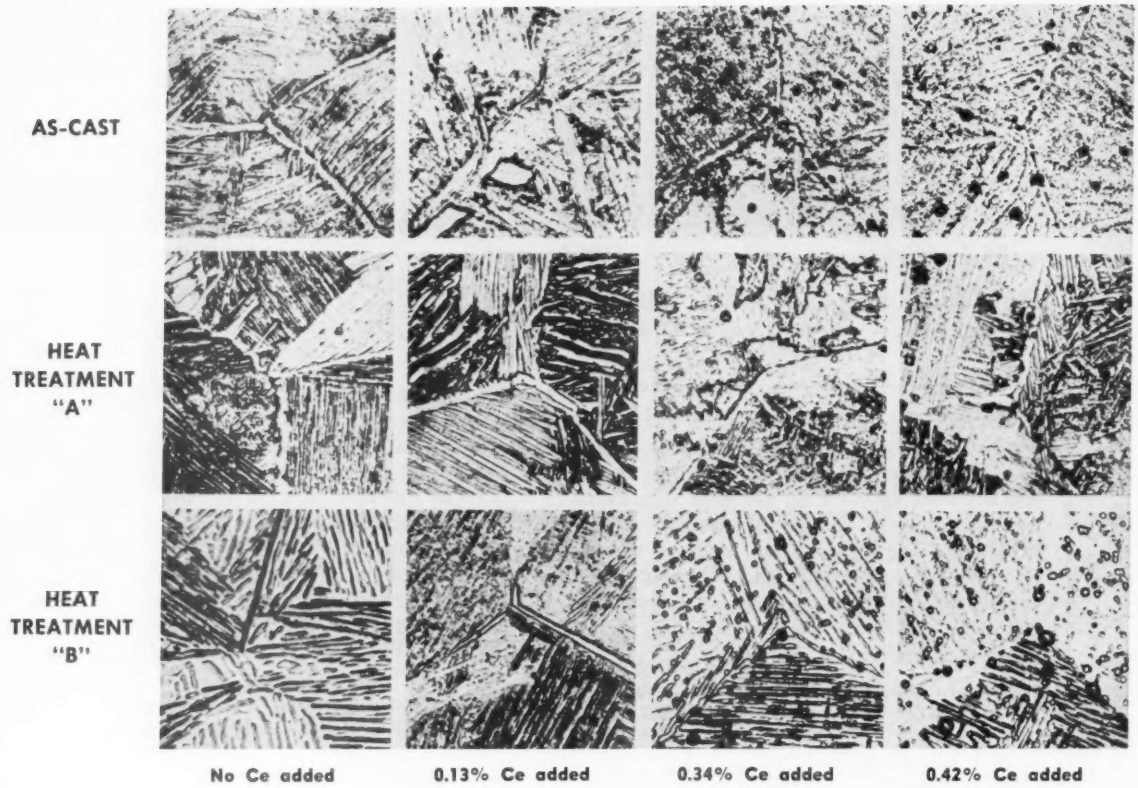
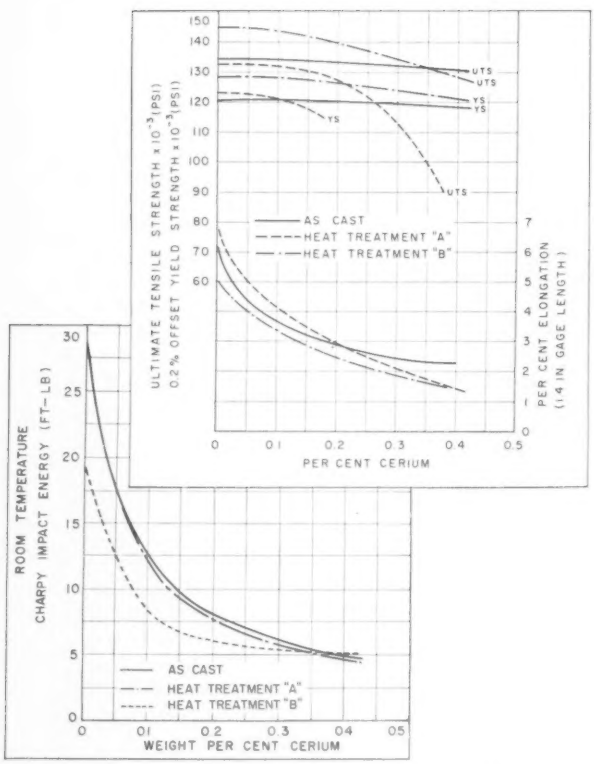


Fig. 3 — Microstructures show effects of heat treatment and cerium additions on titanium-6 per cent aluminum-4 per cent vanadium alloy



Figs. 4 and 5—These charts show (Fig. 4, top) the tensile properties and (Fig. 5, bottom) room temperature impact properties of cast and heat treated titanium-6 per cent aluminum-4 per cent vanadium alloy with varying additions of cerium

ly coincident with the curve for the cast specimens (Fig. 5).

No major variation in hardness was found with respect to cerium content for the "A" heat-treated alloys.

Specimens given the "B" heat treatment also exhibited loss of strength and ductility when cerium was added. The reduction in strength was not as drastic as that noted in the series of alloys that received the "A" heat treatment. The ultimate tensile strength of the "B" heat-treated alloys decreased from approximately 145,000 to 128,000 psi as the cerium content was increased to 0.42 per cent. The yield strength decreased from 129,000 to approximately 120,000 psi. The elongation for this series of alloys was the lowest of the three different series tested. Cerium additions also caused a decrease in the impact strength for the "B" heat-treated alloys (Fig. 5).

No major variation in hardness was found with respect to cerium content for this series of alloys. Complete mechanical property data are shown in Table II.

TABLE II—Mechanical Properties of Cast and Heat Treated Titanium-6 per cent Aluminum-4 per cent Vanadium Alloys with Cerium Additions

Specimen	Condition	U.T.S. (psi)	Y.S. (psi) Offset 2%	Elong. (1.4 in. gage) %	R.A. %	VPN Hardness (10Kg Load)	Impact Strength Room Temp. (ft-lb)
OC	As Cast	133,700	119,800	6.4	21.0	301	30.0, 29.5
3C	As Cast	134,500	121,400	3.3	6.7	288	9.0, 10.5
5C	As Cast	129,500	118,600	2.3	1.7	334	5.0, 5.0
1C	As Cast	130,900	118,100	2.3	3.3	286	4.0, 5.0
OA	"A"	132,700	123,100	7.1	13		
	1400° F	131,900	122,900	7.1	17	278	28.0, 33.0
3A	½ hr. WQ	132,300	120,700	3.6	..		
	8 hr. 1100° F	131,500	.....	..	..	286	10.0, 10.0
5A	AC	95,900	.....	..	..		
		80,100	.....	..	..	271	4.0, 6.0
1A		91,100	.....	1.3	..	269	3.5, 4.5
OB	"B"	147,600	131,900	5.0	9.3		
	1700° F	140,700	126,700	..	..	325	21.5, 18.0
3B	½ hr. WQ	144,400	130,900	2.1	4.4	318	6.5
	2 hr. 900° F	143,700	.....	2.9	..		
5B	AC	124,500	117,700	1.4	..	306	4.0, 6.0
		133,200	.....	1.9	..		
1B		127,300	125,700	..	..	335	5.5, 6.0
		134,500	126,500	..	..		

Discussion—The fact that cerium additions reduce the cast grain size of several commercial titanium alloys is evident from the previous work of Taylor[3]. The present investigation confirms this effect in another alloy. The theoretically predicted beneficial effect of smaller grain size on the mechanical properties could not be found, however, because it is apparently overshadowed by other factors. The gross result of adding cerium to the alloy studied in this investigation is to impair seriously the mechanical properties.

A study of the microstructures of the various specimens revealed the presence of a third phase (Fig. 3). This third phase appears as small spheroids dispersed throughout the grains and at the grain boundaries in the alloys with the higher cerium contents. These spheroids are probably a cerium-rich phase.[4]

Examination of the impact fractures revealed a difference in fracture appearance, depending on the amount of cerium added. In the alloys with no cerium, a fine fracture was observed. With the addition of 0.13 per cent cerium, the fracture was mostly fine. In some of the specimens, however, patches of coarse fracture were observed. The alloys that contained 0.34 and 0.42 per cent cerium exhibited fractures that were almost entirely coarse. Similar types of fractures were observed for the tensile specimens. Microscopic examination revealed the fine type fracture to be transgranular, while the coarse fractures were intergranular. From these observations, the loss of tensile strength, ductility, and impact strength may be attributed to the presence of cerium or a cerium-rich phase in the grain boundaries.

From Fig. 4 it can be seen that the tensile strength of the "A" heat-treated alloys decreased more rapidly with the addition of cerium than either the cast or "B" heat-treated alloys. The reasons for this sensitivity to the "A" heat treatment are not fully understood at this time.

Conclusions:

1. Cerium reduces the cast grain size of a 6 per cent aluminum-4 per cent vanadium-titanium alloy.
2. Cerium has little effect on the ultimate and yield strengths of a cast, unheat-treated 6 per cent aluminum-4 per cent vanadium-titanium alloy. The ductility, however, is severely reduced by the addition of cerium.
3. Cerium decreases the ultimate yield strength and ductility for a cast and heat-treated 6 per cent aluminum-4 per cent vanadium-titanium alloy.
4. Cerium reduces the impact strengths of a cast and heat treated 6 per cent aluminum-4 per cent vanadium-titanium alloy.
5. The loss in ductility and strength that accompanies the addition of cerium to a 6 per cent aluminum-4 per cent vanadium-titanium alloy may be attributed to the presence of cerium or a cerium-rich phase forming at the grain boundaries.

Acknowledgments — The authors wish to express their appreciation to H. Markus, director, Metallurgical Laboratory, and H. Rosenthal, assistant director, Metallurgical Laboratory, Pitman-Dunn Laboratories, for providing the assistance required in carrying out this study, and to H. McCurdy, who prepared the alloys.

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Questions and Answers

Trouble with wheel tread chills becoming out of round may be due to several causes . . . Cracking of cable clamp after galvanizing caused by design . . . Has hard surfaces . . . Eliminating the use of facing sands . . . Considers molding processes

Chills for Wheel Tread Warp

QUESTION We have an order for several double flanged wheels similar to crane wheels to be made of cast iron with a chilled and ground tread. We have made this type wheel in the past with a split chill bolted together, but it has caused considerable trouble as the chill warps out of round and has to be discarded after making only a few wheels. Can you suggest a design of chill which will hold its shape better?

ANSWER Possibly your trouble with the chills warping out of shape may be due to the type of iron used in making them. Preferably, they should be made of iron with a high total carbon content since such material has relatively good resistance to thermal shock. Perhaps addition of some chromium and/or molybdenum to the iron used for the chills may increase the resistance to heat.

Again the chill may not be sufficiently thick to absorb the heat without being raised to a high temperature throughout. A suggestion is to try chills with narrow vertical slots in the face—about 1/16 in. wide, ⅜ to ½ in. deep and 2 to 3 in. apart. Slot openings at the face can be filled by applying a thin coat of blacking, drying the chill thoroughly before use.

Galvanized Castings Crack

QUESTION We are having trouble with a cable clamp produced in our foundry in Japan. Castings are made in blackheart malleable iron and, when galvanized, cracks appear at the point indicated in the accompanying photographs. We will appreciate details showing proper gate, runner, riser, etc., avoiding location of the riser inside the loop. Metal is duplexed with a cupola and direct-arc electric furnace. Average analysis shows 2.5 per cent C, 1.0 per cent Si, 0.32 per cent Mn, 0.100 per cent S, 0.08 per cent P, and 0.03 per cent Cr. Natural molding sand practice is employed.

ANSWER Study of the photographs and drawing submitted leads us to the belief that the trouble is a matter of design. It results from stresses created by the differences in rate of heating between the light and heavy section when the casting is immersed in the molten zinc bath.

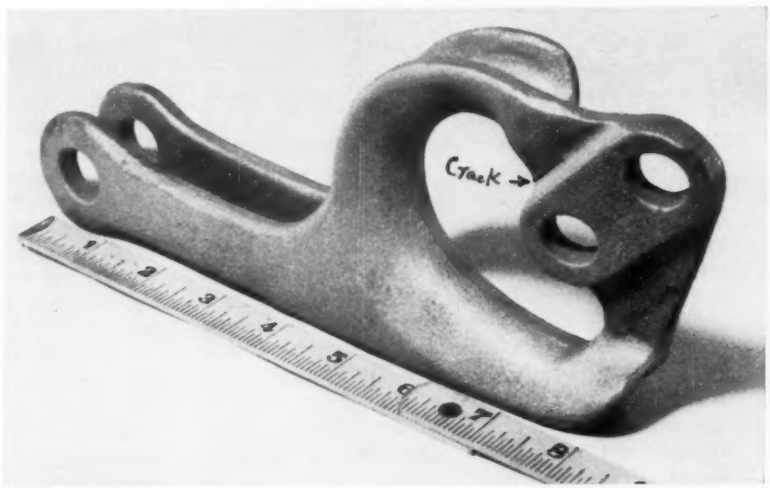
Undoubtedly, if the heavy section could be reduced in thickness to approximately that of the adjoining section, the trouble would be eliminated.

Possibly you feel that some embrittling action may occur as the result of hot galvanizing, but that is encountered only when the phosphorus is somewhat high; and the content you show is well below that at which difficulties are met. If you suspect any occurrence, you might try heating the castings to about 1250°F and quenching in warm water prior to galvanizing.

In gating we would be tempted to try ingates near the point where the loop portion joins the two legs. That could be accomplished with a vertical passage above and below the mold joint to attach to the upper and lower edges of the casting at that position. If the core projects, the hole could be made in the core. A blind riser is located adjacent to the ingates. It is attached to them by a short runner, and also to the down sprue near the edge of the flask. By turning the patterns end for end, two castings could be fed from the same sprue and riser.

Measuring Surface Hardness

QUESTION In our gray iron castings we are running across certain machining difficulties which our machine shop attributes to surface hardness. We test our castings with the conventional brinell hardness machine. Although the castings show hardness numbers between 180 and 207, the castings are hard to machine. As the hardness is only superficial, we feel that the brinell machine is not capable of indicating surface hardness, and that there is some type of equipment which will measure the surface hardness we encounter. Also can you suggest any precautions to be taken in our foundry to overcome such hardness in the castings?



Crack as indicated occurs at the junction of heavy and light sections

ANSWER It is unfortunate that more definite information was not given on the surface hardness encountered, and particularly on where it occurs. We suspect that it is what commonly is termed "hard edges or corners" caused by rapid cooling rates resulting from exposure of the solidifying metal to two adjoining mold surfaces. That tendency will be increased if the edge or corner is along the mold joint, and the fit is such that fins are permitted to form. Trouble of that type often can be overcome by the addition of some

type of graphitizing agent such as ferrosilicon, coarse powdered graphite, etc., to the ladle.

We believe that measuring or detecting such hardness can be done satisfactorily with your present machine provided the testing is performed on the areas where it occurs or tends to occur. The inability to determine differences in hardness might be caused by removing too much of the surface in preparing the area for the test or indentation. It might be interesting to conduct tests with different degrees of preparation and compare the determinations at the prepared areas with those of immediately adjacent areas without such treatment.

A logical approach in determining surface hardness could be use of an instrument which measures the scratch hardness by drawing a diamond across the surface under a light load. Such an instrument, however, is primarily for laboratory use. Some time ago, in discussing flame hardening of cast iron, Scott indicated that the scleroscope is best suited to determine hardness in that operation. It measures hardness by the rebound of a diamond-tipped hammer dropped on the surface from a definite height. He also mentions that the Rockwell instrument, using the "C" scale, can be used.

An All-Purpose Sand Mixture

QUESTION We are working to improve sand practice on our sand-slinger floor where we produce castings ranging from 500 to 5000 lb with an average metal thickness of ¾ to 1 in. We are installing sand screening and mulling equipment and are interested in altering our practice so that we can make some of the smaller and lighter jobs by using a green sand facing and make the larger jobs by skin drying, but by using an all-purpose sand rather than a facing. By using an all-purpose sand on the larger work we hope to speed up our ramming operation by running all our sand through the slinger and eliminating the application of facing and hand ramming operations.

We would like an appraisal of the possibilities and recommendations for a starting point in establishing an all-purpose sand for skin drying and a special facing for green sand. At present the new sand used has an AFS fineness of 30 with about 63 per cent on the 12 to 40-mesh screens; clay content 15; minimum green compression 11 psi, and green permeability 400. Facing is composed of 50 per cent used sand, 50 per cent new sand with 1½ per cent pitch, and 6 per cent moisture. Backing sand is used sand, and molds are skin dried. We also have available a 70 AFS fineness sand with about 66 per cent on the 50 to 140-mesh screens; clay content 17; minimum green compression 11 psi, and green permeability 90. Still another sand with an AFS fineness of 148 shows about 42 per cent on the 70 to 200-mesh screens; clay content of 18; minimum green compression 8 psi and green permeability of 24 is available.

ANSWER Your best procedure would appear to be to get a new supply of sand with an average AFS grain fineness of 55 and a four-screen distribution. Before taking that step, however, it might be well worth while to give the 70 AFS fineness sand a chance. While the sand is somewhat finer than desired, it should serve satisfactorily in production of the light and light-medium work without using facing. Probably in the case of medium and medium-heavy jobs it may be advisable to try torch drying to a depth of ⅛-in. or so. In the case of heavy work, skin drying to a sufficient depth to permit setting all cores and still leave a reasonable depth of dried surface for the metal to rest against should serve. It might be pointed out that the drying of the surface does not change the over-all permeability of the sand to any great degree, but removing the moisture reduces the amount of steam or gas that has to be carried off.

You may wonder why we do not suggest some blending of the coarse 30 fineness and the 70 fineness sands to produce an intermediate type which would serve. Difficulty lies in the large differences in grain sizes and distribution. When sufficient finer sand is added to the coarse to obtain any real effect, the grain distribution spreads out to a point indicative of considerably lower permeability.

While the calculation may not be exact, indications are that a half-and-half mixture of the two would provide a grain fineness of about 48, but only 40 per cent would be on the 50 to 100-mesh screens, 14 per cent on the 20-mesh, and 77 per cent on the 20 to 100-mesh. With a view of reducing the high quantity of the 20-mesh sand which would tend toward rough surfaces, a blend of 30 per cent coarse and 70 per cent finer sand was considered. Calculation indicated that this would provide a fineness of about 58 with around 52 per cent on the 50 to 100-mesh, and 88 per cent on the 20 to 140-mesh screens. In both cases the wide grain distribution suggests close plugging of pore spaces and consequent low permeability.

Permanent Mold vs Green Sand

QUESTION Can you give us any information on comparison of the permanent mold process with the green sand process on the basis of 1) quantity of production per man-hour, 2) quality of product as regards durability, machinability and consistency and 3) consumer preference. We are considering a change of method.

ANSWER Definite reply to your inquiry is extremely difficult since sufficient information is lacking. Nothing is said as to what metal or alloy is to be poured into the molds, or what the castings are. Like any other process, the permanent mold method has its limitations and not all castings are amenable to it.

A number of factors affect production rates. One is the type of metal or alloy. Due to differences in pouring temperatures and heat capacity, the production rate for aluminum alloys will be higher than for cast iron—but size of the casting and section thickness will also have an effect. Again, if the castings are small and can be made in a multiple cavity mold, the production will be higher than for a single or double cavity mold. Complexity of the mold also must be considered. A simple two-part mold can be operated more rapidly than a multi-piece or section mold.

We do not understand the terms "durability" and "consistency." If durability means a serviceability of the casting, the results should be equal or possibly slightly in favor of the permanent mold casting. If by consistency is meant uniformity of product, it can be said that with good commercial practice, the castings will be uniform.

As to machinability there should be little if any difference in the nonferrous alloys such as aluminum. With cast iron, however, the cast-

ings undoubtedly will have to be annealed before machining, but section thickness of casting and time of removal from the mold will have a bearing.

The fact that closer dimensional tolerances as well as smoother surfaces can be obtained with permanent molded castings than with green sand castings helps to swing consumer preference to the former type.

Using Molding Sand Additives

QUESTION In our foundry in New Zealand we are using seacoal additions to the facing sand, but are considering changing to additions of wood flour in order to 1) prevent marking on enameled castings, and 2) reduce the dirt and dust factor which discolors all our white walls. Can you advise us on all points for and against the use of coal dust or wood flour in facing sand, types of wood used for the flour, equipment for making the flour, and any specifications relating to the flour.

ANSWER While the primary purposes for which seacoal and wood flour are added to molding sand are somewhat different, the effects have certain similarities. Seacoal is added to provide a smooth skin on gray iron castings as well as promote a better "peel" or separation of sand from the casting. Wood flour is added to provide a "cushion" for expansion of the sand grains. However, to some degree seacoal functions in a similar manner.

Seacoal burns in contact with molten metal, generating reducing gases which fill the mold cavity and coat the sand grains at the interface with carbon. Efficacy of seacoal additions to molding sand largely is attributed to those factors. Wood flour, being finely divided organic material, also burns and to a certain extent creates the same previously mentioned conditions as does seacoal.

Since there are many similarities between the two additives, it appears that a good possibility exists in replacing one with the other, but the extent will have to be determined by experiment in each case. We would try as a start the replacement of about half the seacoal with wood flour, and then after sufficient time to observe the results, gradually reduce the amount of seacoal, making slight adjustments in wood flour content, if necessary.

Due to the wide differences in the bulk or weight-volume of the two materials, the changes in amounts must be made by volume and not by weight. Seacoal weighs about 9 lb per gallon while wood flour weighs about 2½ lb per gallon.

Wood flour additions require increase in moisture content of the sand—about 1 pint per lb of flour.

Wood flour is available as untreated and treated material, the latter referring to removal of resin content. Maple, beech and ash woods seem to be preferred for their lower resin content, although some wood flours are made from the light-colored woods such as pine and spruce. Some types of wood flour are made by grinding sawdust and shavings in attrition mills. Wood flour is available in this country from 40 to 200 mesh, but indications are that for foundry use the material, like seacoal, should not be too fine or too coarse. One maker states that 98 per cent passes through 50 mesh and 40 per cent passes through 100 mesh screens.

Production of Nodular Iron

QUESTION Can you supply us with any information on production of nodular iron? Is a special alloy used? Is it possible to pour direct from the furnace without heat treating? What type of furnace is best suited for production?

ANSWER Since patents exist on production of nodular iron, we suggest you investigate that phase before proceeding.

Essentially the material is made by addition of magnesium-bearing material to molten cast iron of low-sulphur content. The most common melting unit is the cupola, using either an acid or basic lining. With acid-lined cupolas the molten iron usually is desulphurized with soda ash or by injection of calcium carbide or a combination of both. In most cases the magnesium addition is in the form of a low magnesium-bearing alloy, since use of metallic magnesium alone causes considerable fumes and pyrotechnics due to its boiling point of 2048°F.

Nodular iron is not one material but a series of materials with different compositions and properties. At present, ASTM specifications cover two grades based on mechanical properties. One calls for minimums in tensile strength of 80,000 psi, yield strength of 60,000 psi and an elongation of 3.0 per cent. The other requires minimums in tensile strength of 60,000 psi, yield strength of 45,000 psi and an elongation of 10 per cent. The latter usually is obtained by heat treatment of the former.

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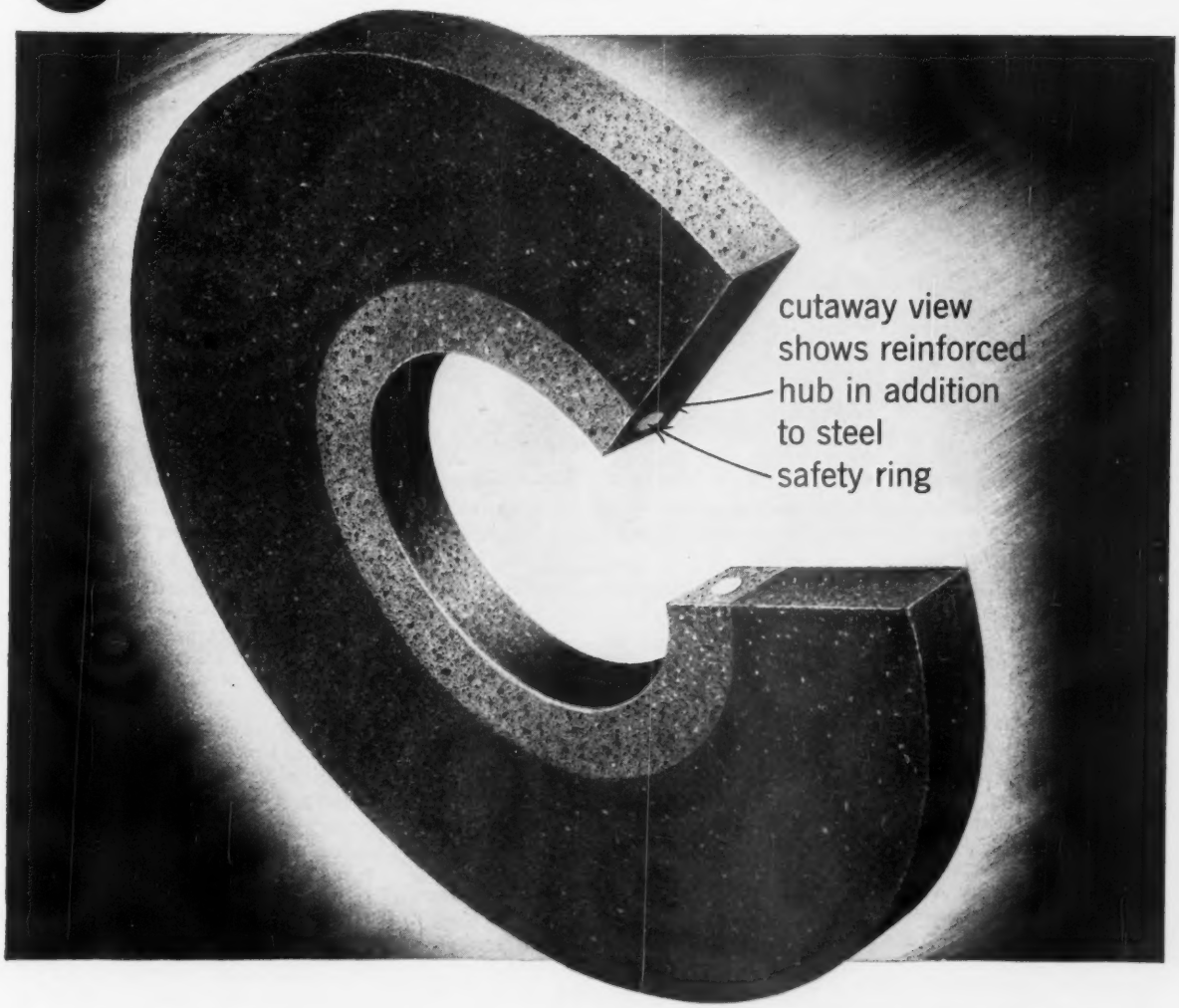

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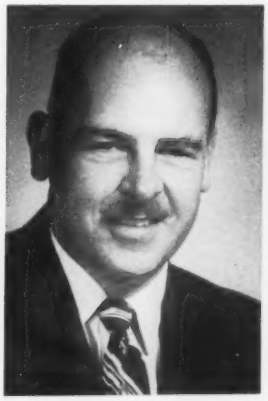
● R. B. COURCHENE
. . . Dayton Malleable v. p.



● ROBERT J. McCARTHY
. . . division gen. mgr.

● C. J. WILSON
. . . joins Bullard Co.

PAUL L. ARNOLD, since 1947 resident manager of the Chattanooga, Tenn., plant, U. S. Pipe & Foundry Co., Birmingham, was appointed resident manager of the Decoto, Calif., plant, succeeding **C. R. Tinsley,** retired. A graduate of Copenhagen University, Denmark, Mr. Arnold joined the company's engineering department at the general office in 1930. A former president of the Tennessee Chapter of the AFS, Mr. Arnold was re-elected president of the National Foundry Association for this year, and is also president of the National Castings Council. **Howard M. Barker,** production superintendent at the Chattanooga plant, succeeds Mr. Arnold as resident manager there. Mr. Barker attended Tennessee Polytechnic Institute and for 35 years has served in various capacities at Chattanooga.

M. D. McQuary, since 1943 pattern buyer for the raw material department, Chrysler Corp.'s central purchasing department, Detroit, was appointed purchasing supervisor for the company's Forge and Foundry Division. Mr. McQuary attended Central College and was graduated from the Henry Ford Apprentice School in 1940.

Paul R. Flood, general manager of the Pomona, Calif., plant, Fairbanks, Morse & Co., Chicago, was named resident general manager for the company in Beloit, Wis. He succeeds **W. E. Watson** who resigned to become general plant manager, Beloit Iron Works in Beloit.

● **R. B. Courchene,** director of industrial relations, Dayton Malleable Iron Co., Dayton, O., was made a vice president of the company. He joined Dayton Malleable in 1951.

● **Robert J. McCarthy** will continue as president-general manager, Missouri Refractories Co., Los Angeles, while acting under appointment of Mexico Refractories Co., Mexico, Mo., as general manager of its Atlantic division. Mexico Refractories is constructing warehouse facilities in Elizabeth, N. J., to serve metropolitan New York. Mr. McCarthy was engaged in firebrick and general construction work for 19 years previous to the organization of Missouri Refractories in 1951.

Francis T. McGuire, since 1949 manager of the materials engineering department, Deere & Co., Moline, Ill., was named works manager of its subsidiary John Deere Harvester Works, East Moline. After receiving his doctorate in metallurgy from University of Notre Dame, he was laboratory director, Republic Steel Corp., Chicago, for 3 years and plant manager, Sibley Machine & Foundry Co., South Bend, Ind.

Frank F. Elliott was elected chairman of the board of directors, Crane Co., Chicago. He joined Crane 34 years ago, and was named president in June, 1955. **Neele E. Stearns,** until recently vice president for planning and development at Inland Steel Co., Chicago, was named president, succeeding Mr. Elliott.

● **C. J. Wilson** recently joined the Bullard Co., Bridgeport, Conn., as director of manufacturing. A graduate of University of Colorado, he was associated with Westinghouse Corp., Pittsburgh, and until recently was works manager, Mergenthaler Linotype Co., Brooklyn, N. Y.

C. M. Apgar, until recently works manager, Adirondack Foundries & Steel Inc., Watervliet, N. Y., was named vice president - operations. **C. L. Richards,** formerly chief metallurgist, was made vice president-metallurgy and research. **F. E. Ziter** was promoted from manager of sales to vice president-sales. **N. B. Akitt,** chief engineer, is now vice president-engineering.

Earl Hottel, formerly associated with Pennsylvania Transformer Co., Canonsburg, Pa., was named to head the new service and parts department, Lectromelt Furnace Co., Pittsburgh, division of McGraw Electric Co., Chicago. Mr. Hottel will direct customer services and supervise repairs.

Kempton Dunn, for the past 2 years president, American Brake Shoe Co., New York, was elected chief executive of the company. **William B. Given Jr.,** who has been chief executive officer, will continue actively as chairman of the board.

Donald R. Grandy was named engineering and technical consultant for the expanded Cleveland division

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● ELMER E. BRAUN
. . . divisional works mgr.

● LESLIE L. SHAFER
. . . division sales mgr., GMC

● CHARLES E. DRURY
. . . division plant mgr., GMC

● RICHARD S. SMITH JR.
. . . personnel director

office, Lindberg Engineering Co., Chicago, which will likewise serve western New York and Pennsylvania. With headquarters in Cleveland, Mr. Grandy will also represent Lindberg Industrial Corp., for large installations.

● **Elmer E. Braun,** until recently divisional manufacturing and production manager, was appointed divisional works manager, Central Foundry Division, General Motors Corp., Saginaw, Mich., in charge of manufacturing, engineering, sales and production control. **Leslie L. Shafer,** for the past year assistant sales manager, was named sales manager of the division. **Charles E. Drury,** since 1955 factory manager at Saginaw, has become manager of the division's Danville, Ill., plant. He succeeds **R. V. Righter,** who has joined the staff of the vice president in charge of personnel, GMC, Detroit. **Gordon S. White** was appointed plant manager at Defiance, O., succeeding **F. J. McDonald,** who was named works manager of the GMC Detroit Transmission Division, Ypsilanti, Mich. **Richard S. Smith Jr.,** since 1954 public relations director, succeeds Mr. White as divisional personnel director.

Dr. W. L. Faith was appointed managing director of the Air Pollution Foundation, Los Angeles, succeeding **Dr. Lauren B. Hitchcock,** resigned, who has returned to private consulting practice. Dr. Faith was chief engineer of the foundation since it was organized in 1954.

Gordon C. Curry, Precision Castings Co., Fayetteville, N. Y., was elected a director of the American Die Casting Institute, New York, to serve through 1958, filling the vacancy left by the resignation of **William J. During.**

● **Rawson L. Wood,** president, Arwood Precision Casting Corp., New York, was elected chairman of the Council of Profit Sharing Industries, an organization which serves as a research and information center and aids in organization of profit-sharing committees in trade and industry groups.

John R. McConnell, vice president, American Air Filter Co., Louisville, has retired after 33 years in the air filter industry. He will act as a consultant for the company. Mr. McConnell, who was associated with Reed Air Filter Co., Louisville, when it merged with American and other air filter companies in 1929, became sales manager at that time. He was named a vice president in 1938 and advertising director in 1940.

Frank Traviglia, formerly assistant treasurer, Foundry Educational Foundation, Cleveland, was appointed specialist in office services, in the photo lamp department of the Lamp Division, General Electric Co., Cleveland.

● **F. John Pichard,** for 4½ years district sales engineer in the New York office, was named manager of standard equipment sales, Wheelabrator

● R. V. RIGHTER
. . . GMC personnel staff

● GORDON S. WHITE
. . . GMC division plant mgr.

● RAWSON L. WOOD
. . . heads profit sharers

● F. JOHN PICHARD
. . . Wheelabrator sales

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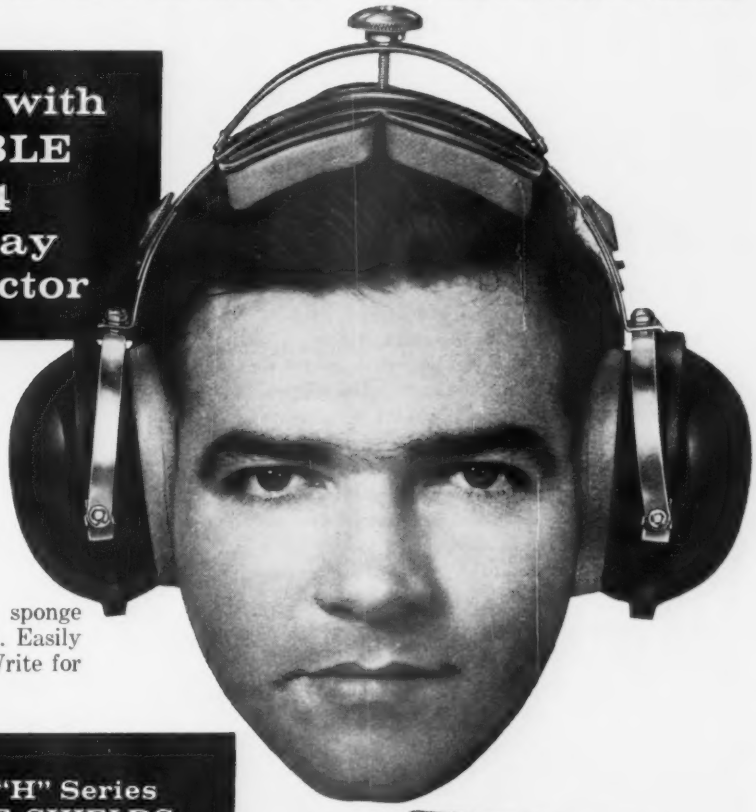

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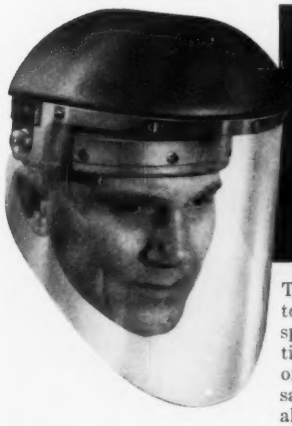

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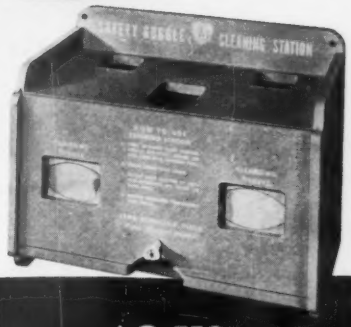

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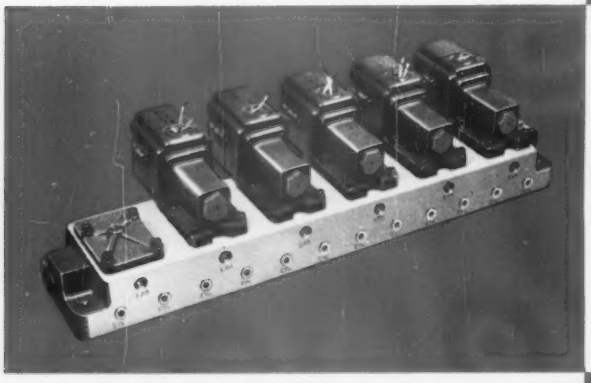

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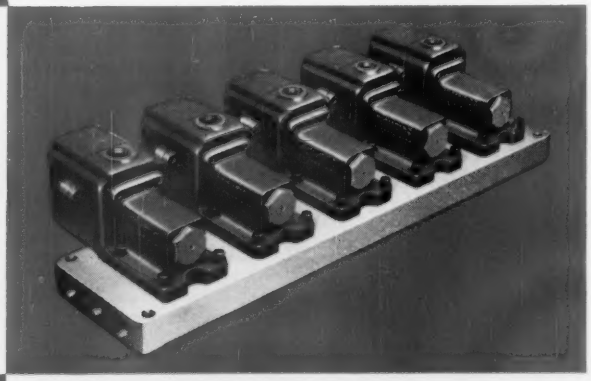

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● JOHN A. MEIMA
. . . technical service mgr.

● EDMOND K. HATCH
. . . division asst. mgr.

● EARL B. SMITH
. . . Osborn sales

● E. HENRY BRAUER
. . . asst. chief engineer

Corp., Mishawaka, Ind., where he will co-ordinate application of the company's equipment to cleaning and finishing problems.

● **John A. Meima,** formerly technical service representative in the New Jersey-Pennsylvania area, was appointed technical service manager for the Chemical Division's foundry department, Borden Co., New York. He joined the company in 1948, after service in foundry management, Wright Aeronautical Division, Wood-Ridge, N. J.

William Pettigrew was named field engineer in the Detroit area, Norton Co., Worcester, Mass. **Russell J. O'Neil** and **Lincoln M. Johnson** were appointed abrasive engineers for the company in metropolitan Detroit.

● **John F. Zaman,** until recently in research and development work for the Machine Division, Osborn Mfg. Co., Cleveland, was appointed sales engineer for the company in Missouri, Kentucky, Kansas, southern Indiana and southern Illinois. After graduation from Case Institute of Technology in 1952, Mr. Zaman joined Osborn as research and development engineer.

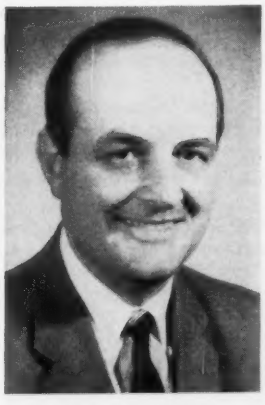
● **Earl B. Smith,** since 1954 assistant manager, was named sales manager, Machine Division, Osborn Mfg. Co., Cleveland. He joined the company in 1928, later becoming a sales engineer in the Machine Division. Other appointments within the division include **Edmond K. Hatch,** assistant manager, and **E. Henry Brauer,** assistant chief engineer. Mr. Hatch, with Osborn since 1950, was formerly supervisor of research and development and assistant chief engineer. Mr. Brauer was a design engineer with the company from 1949 to 1951, when he formed DBM Design Service, rejoining Osborn last year.

● **John F. Wisniewski,** for 16 years associated with Link-Belt Co., Chicago, was appointed foundry sales and layout engineer at the Chicago office of C. O. Bartlett & Snow Co., Cleveland. He has had experience in various phases of foundry operation, industrial and layout engineering.

R. H. Cullen was appointed abrasive engineer in central and southern Indiana, and **James Boyd,** abrasive engineer in Pittsburgh, for Sterling Grinding Wheel Co., Tiffin, O., and Peninsular Grinding Wheel Sales Corp., Detroit, respectively, subsidiaries of Abrasive & Metal Products Co., Detroit.

Mrs. Loye L. Laytham was elected president, William P. Laytham Sons Co., Paterson, N. J., succeeding her husband, the late Allison W. Laytham, who was president since his father died in 1944.

● **Robert L. Knox** and **Herman R. Brown** were named assistant sales managers, Frank G. Hough Co., Libertyville, Ill. Mr. Knox, who was a district sales representative for the company, will handle distributor sales and field personnel contacts. Mr.



● JOHN F. ZAMAN
. . . Osborn sales engineer

● JOHN F. WISNIEWSKI
. . . joins Bartlett & Snow

● ROBERT L. KNOX
. . . Hough asst. sales mgr.

● HERMAN R. BROWN
. . . asst. sales mgr., Hough

Brown, formerly of the order and distribution section of the sales department, will direct manufacturers sales and scheduling operations.

Richard B. Roe, formerly export manager, Beardsley & Piper, division of Pettibone Mulliken Corp., Chicago, recently joined the International Division of Skil Corp., Chicago.

● **John R. Gorey** was appointed sales promotion manager, Lindberg Engineering Co., Chicago, in charge of servicing the company's district offices. He will continue as public relations director.

● JOHN R. GOREY
. . . Lindberg sales promotion

Kenneth G. MacDonald, for the past year product planning specialist in the industrial heating department, General Electric Co., Shelbyville, Ind., was named product sales manager of furnaces and associated equipment for the department. A graduate of Union College, he joined the company in 1946 and was assigned to industrial heating in 1948. He spent 3 years as an industrial heating specialist in the New York sales district prior to rejoining the Industrial Heating Department in 1955.

Philip J. Clough was named director of the metallurgical research department, National Research Corp., Cambridge, Mass. He joined the company in 1946 and has been active in its metallurgy program and in development of metallic coating techniques.

Rovan A. Wernsdorfer was appointed northeastern regional service manager, Black & Decker Mfg. Co., Towson, Md. He joined the company in 1936 and until recently was branch service supervisor for the United States. **Robert A. Brown**, appointed central regional service manager, joined Black & Decker in 1936 and formerly represented the company in Tennessee. **Elmer G. Shue**, named southeastern regional service manager, has been with the company since 1943, recently as sales representative in Virginia and West Virginia.

● **R. D. Baker Jr.** was appointed assistant sales manager of the Coke and Iron Division, Pittsburgh Coke & Chemical Co., Pittsburgh. He joined the company in 1949 after graduating from Williams College.

● R. D. BAKER JR.
. . . assistant sales mgr.

George A. Most Jr. was appointed Boston district manager, Link-Belt Co., Chicago. He joined the company in 1937. **J. Charles Bullock** succeeds Mr. Most as district manager in Moline, Ill. He started his Link-Belt career in Indianapolis in 1935. **Gene A. Zwerner** takes over Mr. Bullock's former duties as district manager in Albany, N. Y. He has been with the company for 10 years. **C. C. Wiley** has succeeded Mr. Zwerner as district manager in Washington. He started with Link-Belt in 1926. **Paul Waldorf** succeeds Mr. Wiley as district manager in Baltimore. He joined the company in 1929.

Marvin W. Formo, formerly research co-ordinator, and **Alexander Olotka**, director of the Newark, N. J., resin laboratory, Archer-Daniels-Midland Co., Minneapolis, were advanced to assistant research directors. **Louis I. Hansen**, research supervisor, was named senior research associate.

Kenneth E. Fritz was named to the metallurgy unit of the Materials and Processes Laboratory, Large Steam Turbine-Generator Department, General Electric Co., Schenectady, N. Y., where he will work on turbine and generator forging alloy development. Before joining GE in 1955 he was with Naval Research Laboratory, Washington, and Bucyrus-Erie Co., Milwaukee.

● **O. G. Specht Jr.** was appointed Detroit district manager, Electro Metallurgical Co., division of Union Carbide & Carbon Corp., New York. He will be responsible for sales activities in Michigan's lower peninsula. A graduate of University of Minnesota, he joined the Chicago office in 1952, after production and sales work with Grede Foundries Inc., Milwaukee.

● O. G. SPECHT JR.
. . . Electromet district mgr.

Philip G. Monteith was appointed assistant to the sales manager, Laclede-Christy Co. Division, H. K. Porter Co., St. Louis. A ceramic engineer, he was previously associated with Chicago Vitreous Corp., Cicero, Ill.

George H. Skirven was named resident sales manager in Virginia, North and South Carolina, and West Virginia for Pennsylvania Foundry Supply & Sand Co., Philadelphia.

G. W. Glass, president, Engineering Service Co., Newark, N. J., was appointed district representative in New York for magnetic equipment manufactured by Magnetic Engineering & Mfg. Co., Clifton, N. J.

Wilburt M. Draisin was named promotions manager, and **Arthur L. Krasnow**, assistant sales manager, Baird Associates-Atomic Instrument Co., Cambridge, Mass.

A. N. Wallin, sales representative, S. Obermayer Co., Chicago, recently completed 50 years of service with the foundry supply company.

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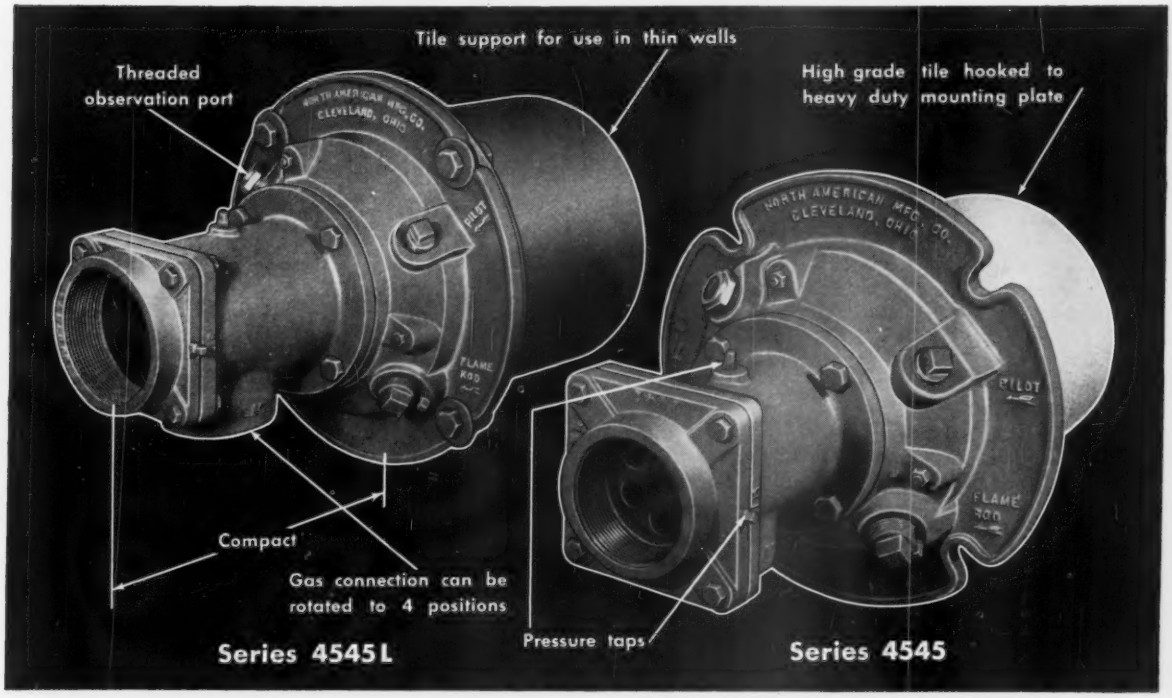

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AFS Chapter Seeks Funds to Support Coleman Scholarship

Philadelphia Chapter of the American Foundrymen's Society has started a campaign for funds to make the William B. Coleman Scholarship Award at Pennsylvania State University self supporting. Foundries and allied industries in the chapter area are being solicited for contributions so that the annual award of $500 to an outstanding senior student majoring in the foundry course at Penn State can be made without using funds required for normal operation of the chapter.

The scholarship was established in 1954 in honor of the late William B. Coleman in recognition of his outstanding service to the foundry industry and to the Philadelphia Chapter.

Contributions and pledges, which can be made over a 24-month period if desired, should be sent to the William B. Coleman Scholarship Committee, Ashland St. below East Lewis St., Philadelphia 24, Pa.

Chicago Foundrymen's Group Elects at Annual Meeting

John R. Shumway, partner, C. W. Shumway & Sons, Batavia, Ill., was re-elected president of the Chicago Foundrymen's Association at its recent annual meeting in Chicago. H. C. Swanson, president, Arrow Pattern & Foundry Co. Inc., Chicago, was elected vice president. R. H. Lehmpuhl, president, Sheffield Foundry Co., Chicago, was re-elected secretary-treasurer.

New directors are B. J. Chelini Jr., president, Troy Brass & Aluminum Foundry Inc., Chicago, and H. J. Leddy, general manager, McDonough Street Foundry Division of Infilco Inc., Joliet, Ill.

The association maintains offices at 343 South Dearborn St., Chicago, with Mildred Kosar as executive secretary.

How To Train for the Future

How to prepare managers and supervisors for future responsibilities is discussed in a 63-page booklet published by the American Management Association, 1515 Broadway, New York 36. Priced at $1.75, the publication includes reports by several top executives based on their companies' actual experience in strengthening supervisory and executive performance.

HISTORIC LOCOMOTIVE HITS END OF LINE

Had First Bed with Integrally Cast Cylinders

THE first locomotive ever built on a Commonwealth one-piece, cast-steel bed with cylinders integrally cast was presented recently to the Museum of Transport, Kirkwood, Mo., by General Steel Castings Corp., Granite City, Ill., after 30 years of service for the Terminal Railroad Association of St. Louis.

Designed and manufactured by Commonwealth Steel Co., predecessor of General Steel, the intricate and difficult bed castings were standard on almost all locomotives built in the United States during the great days of steam. They still are being cast by General Steel and supplied in quantity to railroads all over the world, including some in such distant countries as South Africa, India and Australia.

Locomotive 318, the one presented to the Museum of Transport, served as a heavy switching and transfer locomotive.

The big steamer was especially dependable for hauling heavy tonnage over the Mississippi River bridges and wherever steep grades and sharp track curvatures called for real power.

The famous one-piece casting of the frame and cylinders greatly strengthened and simplified its construction by reducing the number of parts which had to be bolted or riveted together.

The accompanying illustration shows Charles P. Whitehead, left, president, General Steel, handing the title to Locomotive 318 to A. K. Atkinson, board chairman, Museum of Transport.

Watching the ceremony, left to right, are Harry R. Bartell and Howard F. Park Jr., General Steel; Clark Hungerford, St. Louis-San Francisco Railway; G. Fred Driemeyer, General Steel; Dr. John P. Roberts, Museum of Transport; James MacDonald, General Steel; Robert E. Stevenson, Gulf, Mobile & Ohio Railroad; and Armstrong Chinn, Terminal Railroad Association.

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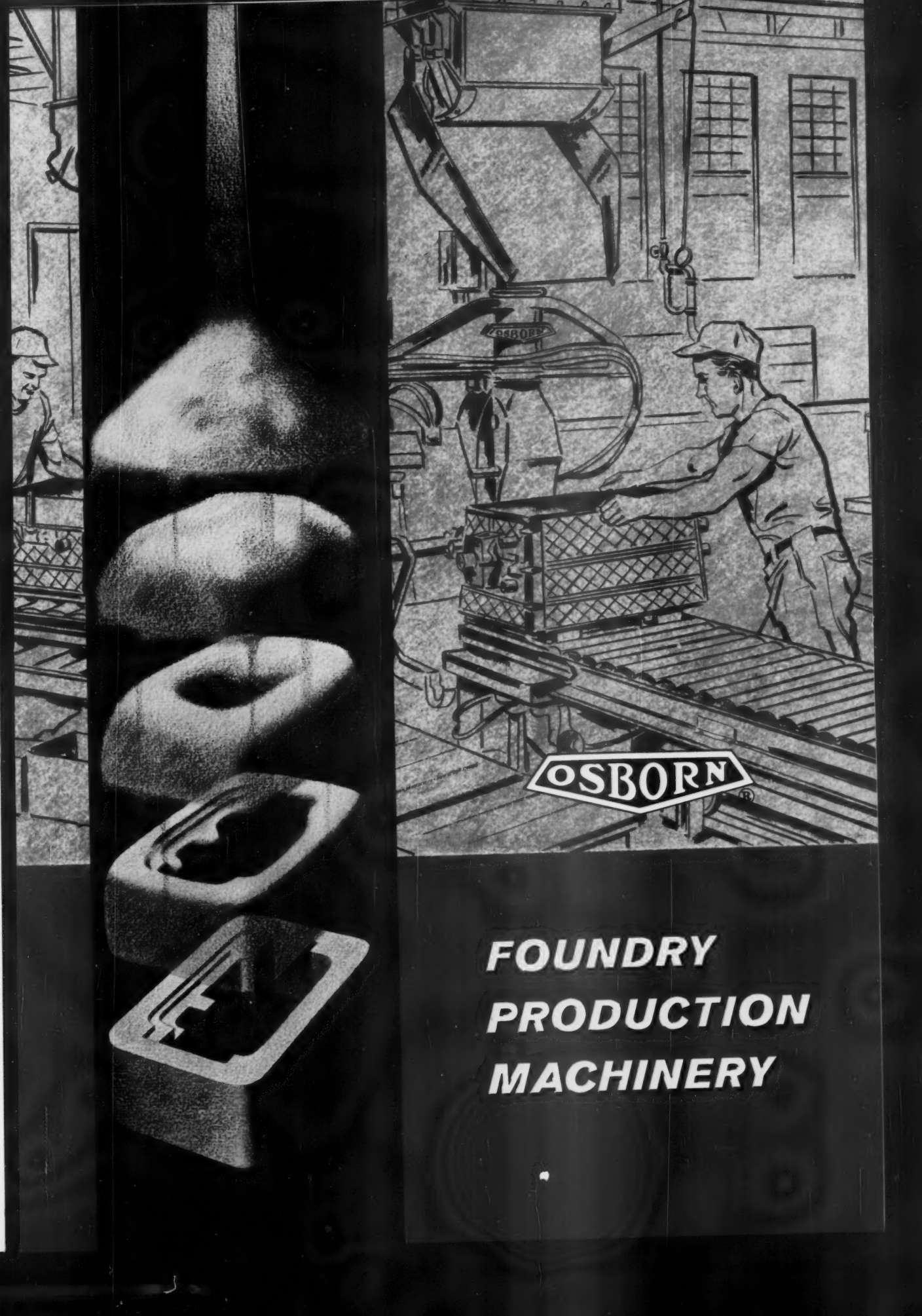

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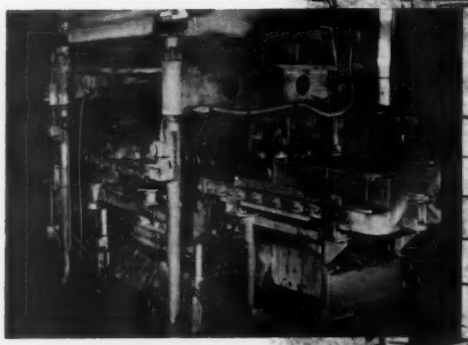

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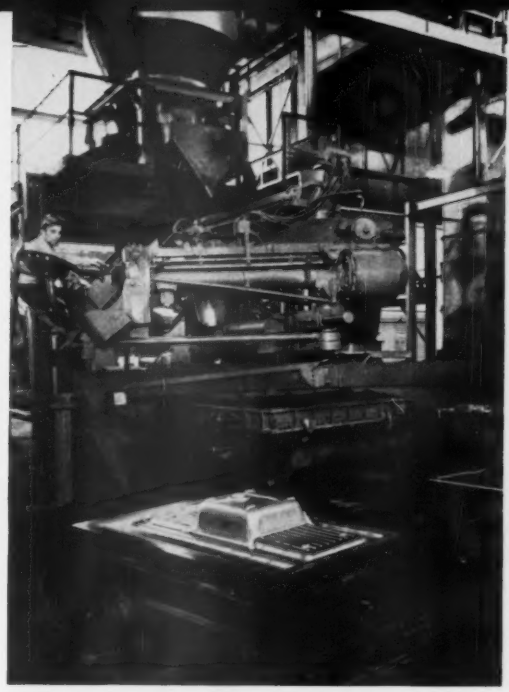
MECHANIZATION in Small Foundries

This paper was prepared for presentation at the Latin-American Meeting of Experts, held at Sao Paulo, Brazil, Oct. 19, 1956. It discusses the factors which influence how much a small foundry can mechanize its operations

By CHESTER V. NASS
Vice President
Beardsley & Piper Division, Pettibone Mulliken Corp.
Chicago

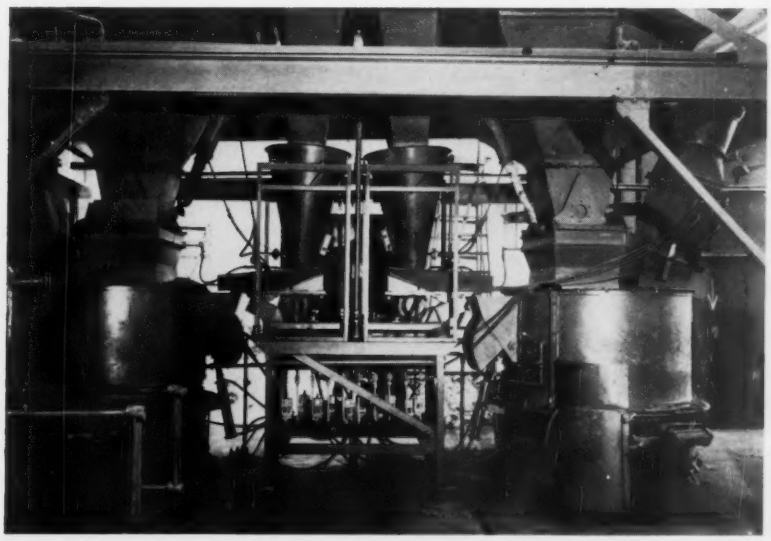


This illustration and the one below show mechanization in Souza Noschese foundry, Sao Paulo

THE subject of mechanization in small foundries cannot have exactly the same meaning in widely separated areas of the world. Continents that differ greatly in the degree of industrialization and mechanization must of necessity take widely varying views of foundry mechanization as a whole and of mechanization in small foundries in particular.

For example, in the United States —and especially in the heavily industrialized sections of the United States—a foundry is not considered as even partially mechanized unless equipment has been utilized to a rather complete extent. At the same time, in some countries of Europe where industrialization is in its earlier stages, a foundry with the same degree of equipment utilization would be considered very fully mechanized, indeed.

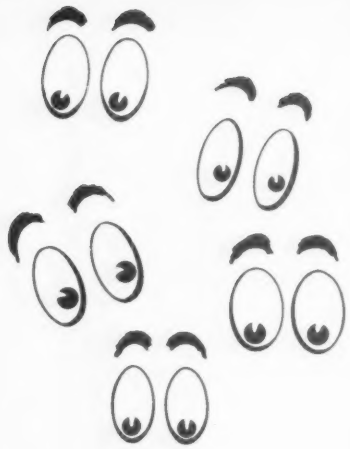
Still another approach must be made in South America where the economy, and especially the industrial segment of the economy demands a different approach to the problem. Most South American countries are going through a very general and widespread dawning of industrialization. These countries are turning to industrialization as a means of raising living standards and generally improving their status. It is only natural that in these countries mechanization is a subject of great interest. It is equally natural that these countries should look to their heavily industrialized northern neighbor—the United States—as a source of technical information on mechanization.



Yet, we know from examples in the United States and other countries that the foundry industry is seldom one of the first of a nation's industries to mechanize. We know too that within the foundry industry, the smaller foundries are necessarily and normally the last to adopt mechanized methods. For this reason, in talking of mechanization in small foundries, our examples must come primarily from countries outside of South America. In South America only a very few of the largest foundries have attained any degree of mechanization.

In the United States when we speak of mechanization in small foundries we generally refer to those foundries employing fewer than 100 people, and in this paper our examples are generally applicable to foundries employing fewer than 50 people.

The class of work and the amount of work done by these small foundries in the United States is dictated by the demands of industry. In South America industry too determines the type, size, nature and amount of work done by foundries;



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with a realization and acknowledgment that these factors are different in South America and the United States let us look at some small U. S. foundries in our study of mechanization.

In past years in the United States, the small foundryman has been prone to say "I can't afford to mechanize." As a small businessman he is very conscious of the cost of major plant equipment, but he is equally conscious of the high cost of unmechanized labor. It is this latter factor that has come so strongly to the forefront in recent years and has caused the small foundryman to "change his tune."

He is now far more likely to think, and even say, "I can't afford *not* to mechanize." Naturally, this latter statement has its limitations. The good small foundryman is also a good small businessman. He realizes that his mechanization, in order to be economically feasible, must be only to that degree which is correct for his shop.

Obsolete Methods Are Ruinous

The small foundryman realizes that obsolete methods are fully as damaging, costly and even ruinous for him as they are for the high-production foundry. He knows too that the failure to meet the competitive challenge of other plants doing the same type of work can mean the complete failure of his business. He realizes that he cannot possibly employ the same methods used by the huge automotive and other foundries that spend millions of dollars each year in replacing satisfactory machinery with more satisfactory, more productive equipment.

It is obvious then, that there is a compromise point—an optimum point of mechanization for the small foundry. A point of mechanization where the small foundryman can operate efficiently and competitively without being swallowed up by overhead charges and over-mechanization. This point changes each year and even each month as labor costs, material costs and other factors change.

In the United States, 25 years ago, common labor was paid 38 cents an hour while a top molder received 67 cents an hour. Today rates are four or more times these amounts and, although the cost of foundry mechanization has risen, the rise has not been nearly as high in proportion to the rise in labor costs. Naturally this casts an entirely different light on the subject of foundry mechanization.

A second factor is as important as

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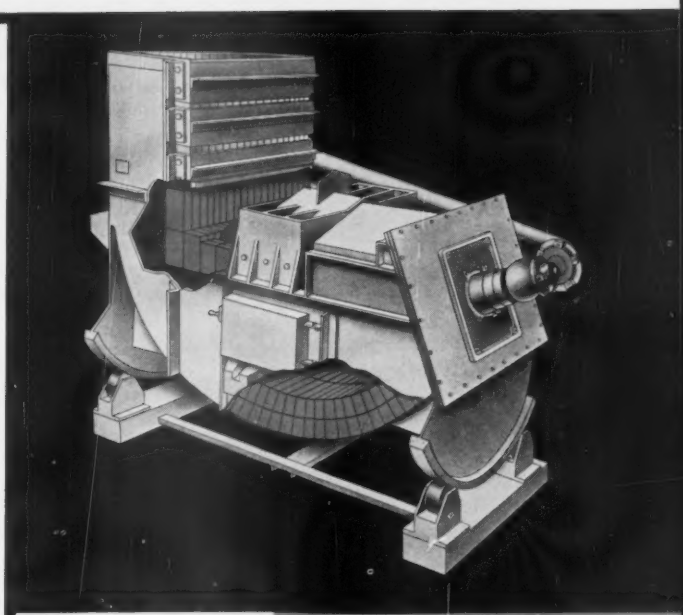
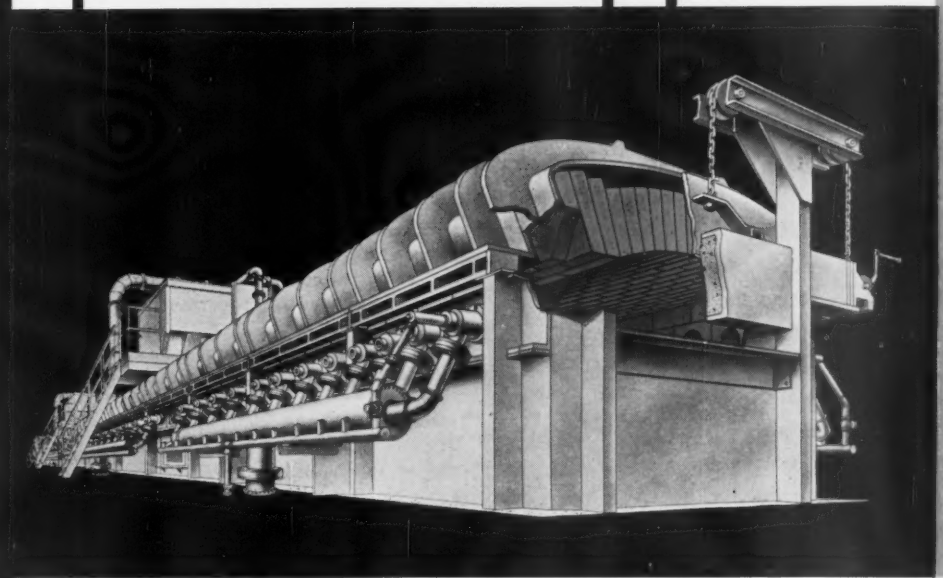
Why B&W Allmul Firebrick withstand punishing service in furnaces like these



Direct-fired reverberatory furnace for melting brass, aluminum, and iron. For longer refractory life, B&W Allmul Firebrick are used to line the bath and arch.



In this type of furnace for continuous high speed heating of strip for welding into pipe, temperatures in excess of 3000 F are common and the atmosphere is contaminated with iron oxide. Because of their resistance to spalling and metal penetration, B&W Allmul Firebrick have set new standards for refractory life in bungs, burner blocks and recuperators.

B&W Allmul Firebrick stand up under extremely high temperatures at continued high rates of operation because they are produced from electrically melted mullite grain by a highly efficient process. These top-quality brick have high hot-load strength, high resistance to spalling, good volume stability and a melting point of 3335 F.

They are practical from a cost standpoint for a wide range of applications in the ferrous and non-ferrous metal industries. Illustrated on this page are a butt-weld furnace as well as a direct-fired reverberatory furnace. Other services are direct and indirect-arc electric furnaces, air furnaces, furnace hearths subject to iron oxide scale attack, crucible melting units and furnaces melting many non-ferrous metals and alloys.

Your B&W representative can show you how B&W Allmul can lower your refractory costs in many heavy-duty services. Consult him or write for Bulletin R-34A, giving data on B&W Firebrick for exacting services.

B&W REFRACTORIES PRODUCTS: B&W Allmul Firebrick • B&W 80 Firebrick • B&W Junior Firebrick • B&W Insulating Firebrick • B&W Refractory Castables, Plastics and Mortars • B&W Silicon Carbide

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B 887

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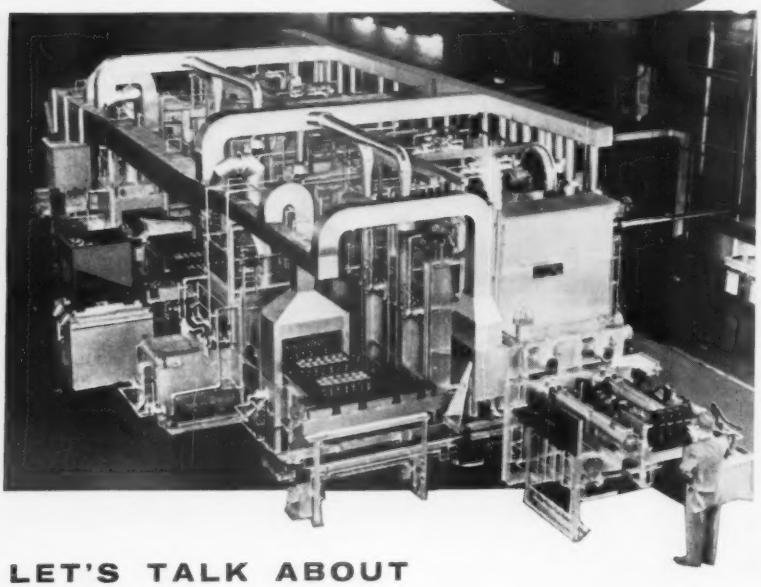

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the cost factor. There is a vast difference in the skills available now and 25 years ago. The skilled molder of 1930 was an artisan who had learned his trade through years of apprenticeship and experience. Few of these artisans are available today. The gap left by their gradual disappearance must be filled by mechanized machinery—machinery that can be operated by semiskilled or even unskilled labor.

Finally, entirely apart from both the cost factor and the skill factor, is the "new method" factor. The foundry industry today is undergo-

MARCH OF DIMES

FIGHT INFANTILE PARALYSIS

JANUARY 2-31

ing a revolutionary transition to newer methods and techniques. There have been entirely new methods like shell molding, as well as a complete revamping of existing methods such as green sand molding.

This shifting in techniques, methods and procedures has brought about a new and all-important emphasis on machinery. Even the most skilled molder cannot duplicate the uniformity in sand mixture or molding technique attained by modern machines. The dependence today must be on machinery and this is true as much in the small foundry as in the larger foundry.

With these three factors in mind —the cost factor, the skill factor and the new method factor—we can see more clearly the reasons for mechanization in small foundries in the United States.

If the small foundryman can purchase a $4000 piece of equipment that will permit him to eliminate one laborer or one molder from an operation, then that piece of equipment will pay for itself in less than a year. This provides an example of the cost factor, and this cost factor must apply also in South America. There, although the labor rates are, of course, very different than those in the United States, the degree of mechanization will often permit the replacement of two or three laborers

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Imitation, they say, is the most sincere form of flattery. Well then, it's small wonder that we're flattered.

Ever since 1939 when we developed and introduced MALLEABRASIVE, it's been imitated. Yes, imitated—*but never equalled!*

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or molders by a single piece of equipment.

As an example of the skill factor we might look at the small foundry that experiences a greatly increased demand for its castings because of industrial growth or for other reasons. In the United States a foundry experiencing such an increased demand finds it nearly impossible to acquire additional highly skilled foundrymen to produce these castings. Instead, it must turn to equipment which can provide the additional production required and can be operated by unskilled or semi-skilled help.

As a final example to illustrate the "new method" factor let us look at the small foundry faced with the competition of other foundries able to produce higher quality work because their control procedures are superior. It is quite possible that these other foundries, employing modern sand preparation and sand molding machinery are able to obtain consistently better casting results.

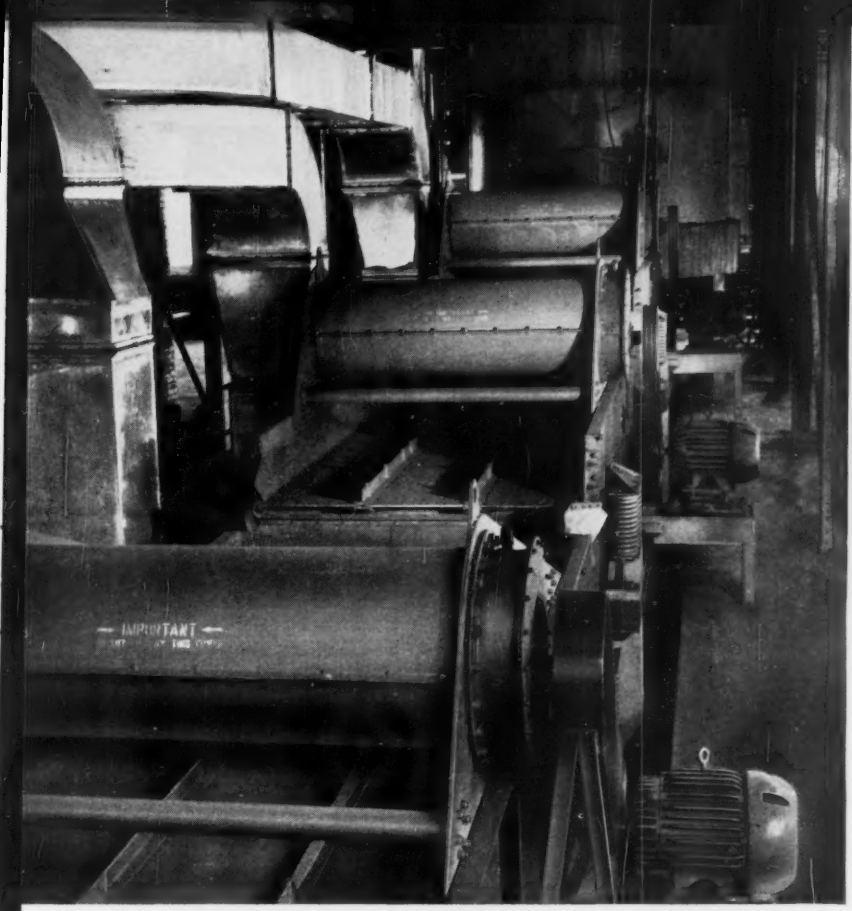
The small foundryman faced with such competition is really coming squarely to grips with the last factor—that of newer methods. In our example he too must then turn to modern methods of sand preparation to compete—that is, to offer a product that is as good as his competitor's.

Obviously in a paper of this nature not all of the factors affecting the mechanization of small foundries can be discussed. There are many other factors—some of great importance—which we have not discussed. The three factors mentioned above, however, will shed some light on the problems and factors to be considered in mechanizing a small foundry.

Points Out Advantages of New Products and Processes

A booklet designed to help small business executives solve problems in technology by pointing out advantages in new products and processes has been published by the Small Business Administration. Entitled *Technology and Your Products*, it is No. 19 in the series of Small Business Management booklets.

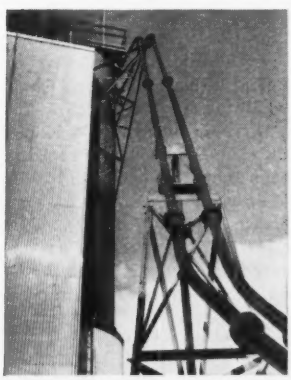
The three parts of the booklet cover, in order, technology and its implications, the application of technology to new products and sources of outside assistance available to small businesses. Copies can be obtained from the Government Printing Office, Washington 25, for 25 cents each.



HOW LYNCHBURG FOUNDRY USED PROFESSIONAL ENGINEERING TO SOLVE HIGH-VOLUME PRODUCTION PROBLEMS AT INDUSTRY'S NEWEST, MOST MODERN SHELL MOLDING PLANT

NEW FACILITIES ENGINEERED BY GIFFELS & VALLET PRODUCE 100 TONS OF FINISHED CASTINGS IN 24 HOURS!

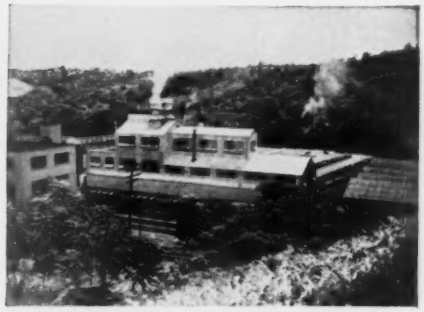
The Lynchburg Foundry Company's new shell molding plant was built to produce large quantities of close tolerance, fine finish castings. Although shell molding is highly adaptable to mechanized operations and offers many other advantages, the planning and engineering for an installation of this size posed many new problems.



Sand is discharged from hopper bottom railroad cars, aerated, and delivered to storage silos pneumatically.

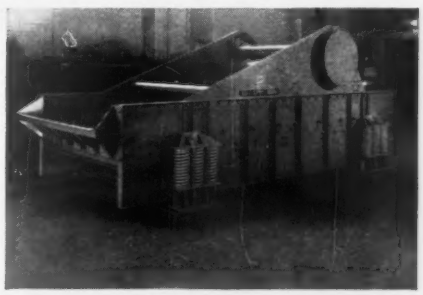
As the project progressed, the extensive facilities of both organizations were coordinated on all phases of design, engineering, equipment specification and construction. In many instances, G & V's background of experience in other industries proved of great value. Two specific examples of this were the methods used to handle the extremely fine molding sand, and the large quantities of iron shot used for shell backup.

The major sand handling problems were to control dust, prevent segregation, and introduce complete mechanization. 100 tons of dry sand with an average AFS fineness of 120 are used per 24-hour day. The sand is removed from box cars into storage silos, batched, and transported to the mullers by a completely enclosed pneumatic handling system. A specially designed cone, orifice and air slide at the base of each storage silo reverses the segregating effect of the sand entering the silo. Batches for the mullers are accurately measured by a unique electronic weighing instrument. This new sand handling system keeps dust and segregation at a minimum, and is similar to the modern mechanized methods employed in the bulk handling of cement, flour, and other dry materials.



Completed plant, looking toward the cupolas.

About 125 tons per hour of shot must be separated from the castings, then cooled and cleansed of sand. This is accomplished by a series of vibrating screens constructed of heavy-duty stainless steel cloth. Air exhausted through the screen at the rate of 150 CFM per square ft. cools the shot from above 300° to below 150°. The screen is designed so that air pull is equal at every point on its surface. Rate of travel and depth of the shot bed can be readily adjusted to meet varying requirements. All transfer points in the system are provided with a "stone box" so that the highly abrasive shot falls upon other shot, rather than abrading the chutes themselves. This method was adapted from similar applications in the cement and rock products industry.



Heavy duty vibrating screens air cool and clean the shot without the use of water.

These are but several examples of the many ways in which Giffels & Vallet's comprehensive planning-engineering services have pointed the way to greater output, lower costs and improved casting quality for the foundry industry. These services are discussed in a special Foundry Brochure. A copy will be mailed on request.

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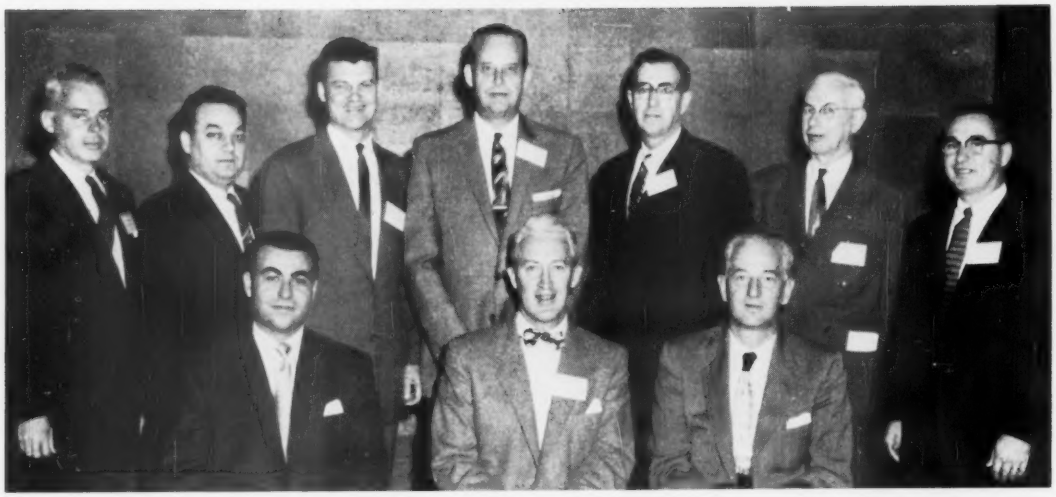


New ICI officers shown seated, left to right, are: Vincent S. Lazzara, Casting Engineers Inc., treasurer; K. W. Thompson, the K. W. Thompson Tool Co., president, and P. W. Schipper, Howard Foundry Co., vice president. Some of the board members are shown in the back row. Left to right: William Matthes, of Arwood Precision Casting Co.; William Worthen, Bone Engineering Corp.; Walter Dubovick, Engineered Precision Casting Co.; Robert Miller of Precision Metalsmiths Inc.; Harry P. Dolan, executive director of the institute; C. R. Whittemore of Deloro Smelting and Robert Kramer, Kolcast Industries Inc.

Investment Casting Institute

Studies Industry Developments

By ROBERT H. HERRMANN
Associate Editor

Awards for their many valuable contributions to the ICI and the industry were made to (left to right) Roger F. Waindle, Wai Met Alloys Co.; Dr. Nicholas J. Grant, Massachusetts Institute of Technology; Ted Operhall, Misco Precision Casting Co.; and Kenneth M. Bartlett, Horizons, Inc. Awards also were won by Edmund G. Chapman, Misco Precision Casting Co., and by Dr. Richard Flinn, University of Michigan, who were unable to be present at the meeting

A BUSINESS meeting, technical sessions and a vacuum melting and casting symposium were featured at the Investment Casting Institute's fourth annual meeting Nov. 14-16 at Hotel Sheraton-Cadillac, Detroit. Attendance at the technical sessions was 120. The vacuum melting symposium drew 149.

Officers and directors elected for the coming year are: President, K. W. Thompson, K. W. Thompson Tool Co., New Hyde Park, L. I., N. Y.; vice president, P. W. Schipper, Howard Foundry Co., Milwaukee; treasurer, V. S. Lazzara, Casting Engineers Inc., Chicago, retiring ICI president.

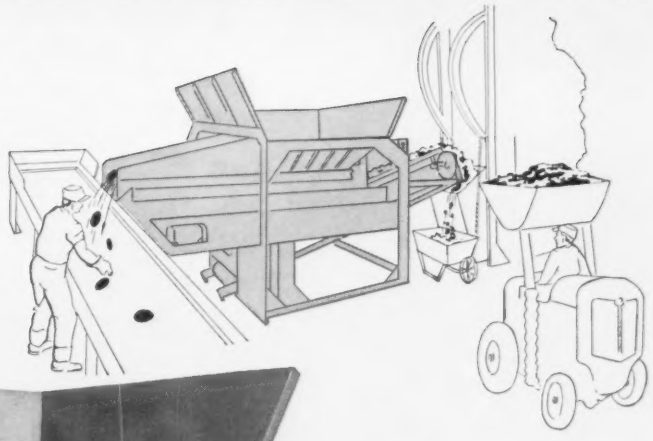
Directors elected for two years include C. R. Whittemore, Deloro Smelting & Refining Co., Deloro, Ont., and R. C. Kramer, Kolcast Industries Inc., Cleveland. Mr. Lazarra was named a director for one year. Directors remaining on the board include W. A. Dubovick, Engineered Precision Casting Co., Matawan, N. J.; W. L. Worthen, Bone Engineering Co., Glendale, Calif.; R. R. Miller, Precision Metalsmiths Inc., Cleveland, and W. I. Matthes, Arwood Precision Casting Co., Brooklyn, N. Y.

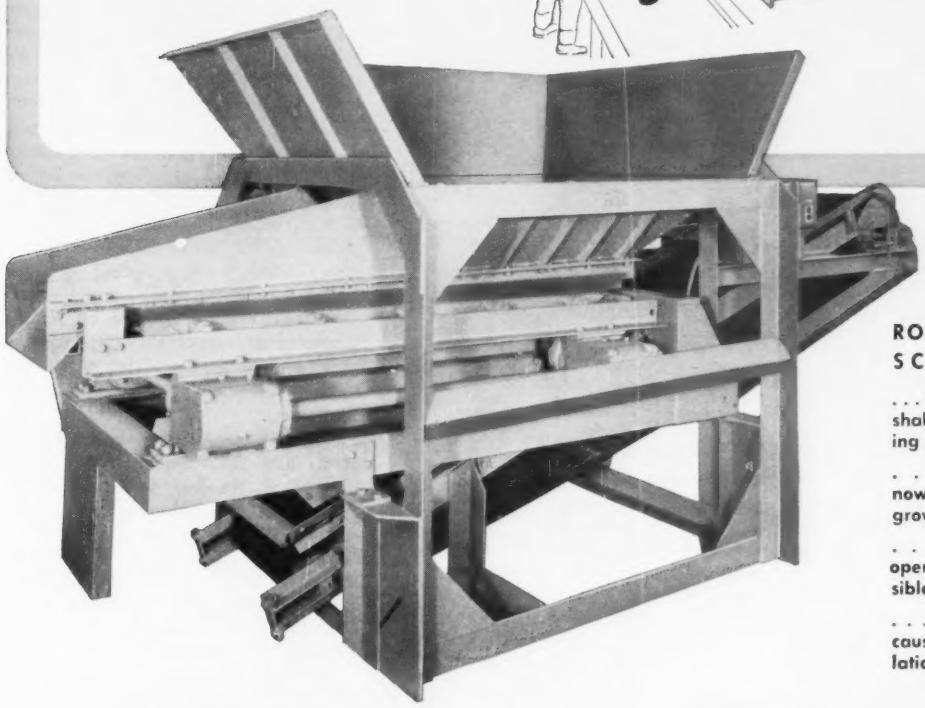
Harry P. Dolan continues as executive director of the institute.

ICI has set up an award program to honor members for outstanding contributions to the investment casting industry. Symbol of the award is an investment cast, stainless steel whale mounted on a rosewood block. Recipients at this meeting were:

K. M. Bartlett, Horizons Inc., Cleve-

One Simple **MECHANIZED** Operation





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. . . eliminates hand labor in shake-out and sand cleaning

. . . gives mechanization now, yet allows for future growth

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....SHAKES OUT castings and CLEANS your sand

The model "S-724-11M" Royer Scrap Control supplies mechanized casting removal and sand cleaning in one fast, efficient operation . . . giving you all of the benefits of labor saving and production line operation at the lowest possible cost.

Front end loaders scoop up sand and castings from the molding floor and deposit them into the ample hopper of the Royer. The rapid, positive walking-beam action of the shake-out breaks up the sand and conveys the castings and large scrap off the end to sorting table or conveyor. Magnetically cleaned sand is discharged at the opposite end to muller skip hoist, conveyor belt to a sand handling system or into a Royer Sand Separator & Blender for complete sand conditioning. Entire unit is above floor level, eliminating costly pits and excavations . . . high casting and sand discharges allow related equipment to also be located above floor level.

Investigate the possibilities for Royer "mechanization" in your plant. This new series of Scrap Controls, with capacities up to 60 tons of clean sand per hour, is available in models to suit your needs. We will be glad to study your operations and make our recommendations at no obligation to you. Write today.

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With a Kwik-Mix R-15 Moto-Bug in your foundry, you can haul 1-ton loads of sand, scrap, slag, cores, flasks, small castings with one-man economy. It's an operator's dream! New automatic power-flow transmission eliminates clutching and shifting — increases Moto-Bug speed and gradability. It travels 12 m.p.h. forward or reverse — climbs 25% grades fully loaded — has 780 lbs. drawbar pull for towing wagons, carts. Hopper body is available in 2 sizes — 15 and 18 cu. ft. (optional) — and is interchangeable with 4½-ft. platform, and 7-ft. fork lift.

LIFTS 1500 LBS.

Equipped with fork lift, R-15 Moto-Bug costs 20% less than other industrial lift trucks of comparable size. You get 1500-pound load capacity at 7-foot height. Forks are 24 to 30 inches long, adjustable 6 to 32 inches wide. Mast tilts back 10° to carry load, 2° forward for pick-up, release. Entire unit weighs only 2060 lbs., works over old floors where heavier lift trucks can't safely travel.

For lighter work, there's a low-cost S-10 Moto-Bug also available with multiple attachments. Get complete details from your Kwik-Mix distributor, or send for bulletin.

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land, as a cofounder and first president of the institute; Ted Operhall, Misco Precision Casting Co., Whitehall, Mich., as a cofounder and second president; Roger Waindle, Wai Met Alloys Co., Detroit, for work on metal specifications; Nicholas J. Grant, Massachusetts Institute of Technology, for technical service; R. A. Flinn, University of Michigan, for work on the ICI instruction course; Harry Dolan, for his work as executive director, and E. G. Chapman, Misco Precision Casting Co., for his report on dimensional tolerances of investment castings. Awards were made by Mr. Lazzara, who in turn received a special plaque presented by Mr. Thompson for work in the term just completed as institute president.

Mr. Thompson presented the first technical paper, **Investment Casting Research.** Basic aims of researchers should be to analyze and report on new casting methods, study new developments and trends and to examine investment casting methods and materials. Research programs can be initiated and financed by manufacturers of equipment and supplies or by individual foundries or groups of foundries. Government funds also might be sought.

Interface Reactions Between Liquid Metal and Mold Surface — by Prof. Howard F. Taylor, MIT. Reactions are caused by mechanical principles, such as failure of the mold surface resulting in rat tails, scabs, buckles or veins. They also are of a physical nature, characterized by metal penetration, or of a chemical nature resulting from oxide formations.

Chemical reactions are caused by constituents of the atmosphere, metal, mold material and mold wash, and result in the formation of oxides. If the oxide formed does not completely cover the surface of the metal, the reaction will continue. The reaction will stop when metal is covered with oxide. Better castings are obtained if the completely covered surface is achieved. Therefore, the addition, usually to the metal, of an element that reacts with oxygen sometimes is desirable.

An Examination and Evaluation of the Glascast Shell Process—by Dr. Nicholas J. Grant, MIT. Glass shells are made by dipping a wax pattern into slurries of granular glass to obtain a desired thickness by several dippings. The first coat generally consists of 75 per cent of 325 mesh, 20 per cent 100-150 mesh and 5 per cent under 100 mesh material prepared as a slurry in various type binders. Granular size of aggregate in subsequent slurries becomes larger.

Shells have a low coefficient of expansion, thus can withstand high

Circle 637 on Inquiry Card—Page 203

Rubber-faced end-liners with replaceable centers

...cut shot breakage up to 50%

...greatly increase end-liner life

With Gates rubber-faced shot blast discs you make BIG savings two ways:

1. **You save on shot because the rubber disc cuts shot breakage.**
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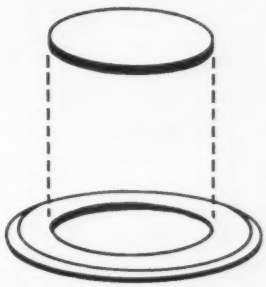
Here's why:

Heaviest wear on end-liners in shot blast and tumble blast machines comes in the center area. With either of Gates two types of disc (center patch, or hollow center), you replace only the center area as needed. Two or three center discs can be used before the main disc is finally worn through.

This important engineering development has increased end-liner service life up to FOUR TIMES.

And rubber protection of end-liners reduces shot breakage as much as 50% — giving you substantial savings on shot replacement costs.

For complete size and cost data, contact any of the Gates Authorized Contractors listed below, or write direct to The Gates Rubber Company Sales Division, Inc., Denver, Colorado.



Hollow Center Disc with Patch Plate

Center disc is recessed flush in hollow center of main disc. Center can be replaced without replacing entire end-liner.

Solid Disc with Center Patch

Both discs easily bolted to main structure of shot blast machine.

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824-31st St. No., Birmingham, Ala.

Western Rubber Products Co.
320 So. Grand Ave., St. Louis, Mo.

Circle 638 on Inquiry Card—Page 203

thermal shock without cracking. That property, however, poses a problem in wax removal at temperatures around 275°F. Wax expands more than shells and thus cracks them. Dewaxing at 1800-1850°F is satisfactory because wax has little chance to expand before it melts.

The process is said to produce, within an hour, strong, lightweight shells that can be poured in ferrous or nonferrous metals. The cooling rate of poured shells can be regulated to control grain size of the casting.

Recent Developments in Glascast Slips—by Karl D. Scheffer, Corning Glass Co., Corning, N. Y. Experiments have been conducted on granular glass slurries with clay-base binders. Gum arabic also has been added to some of the slurries. Preliminary results indicate the possibility of a bigger casting yield from such molds.

Wax burnout still is difficult at 1850°F with some cluster jobs. Outlets in addition to the gating system must be provided for wax removal unless the sprue system is such that it receives most of the heat first.

Evaluation of the Investment "X" Process in the Production of Large Castings—written by John J. Turnbull, Metropolitan Vickers Electrical Co., and read by Noel Shaw, Shaw Process Ltd., Newcastle on Tyne, England. The investment "X" process produces molds from wax patterns dipped first into a thixotropic slurry, then into a slurry of granular refractory bonded with ethyl silicate.

Wax patterns are removed by dissolving with trichlorethylene vapor instead of by melting under heat. Thus mold cracking is said to be reduced considerably. Wax may be recovered from the trichlorethylene mixture.

After patterns are out, molds are heated to 1562°F to develop adequate mold strength. Then they may be cooled or heated before pouring.

Investment "X" process does not work well for castings less than 3 in. in longest dimension or for making castings with sections less than ⅛-in. apart. Parts with cast weight of 110 lb have been made.

Metallurgical Characteristics of Alloy 17-4PH—by William C. Clarke, Armco Steel Corp., Baltimore. Stainless steel alloy 17-4PH, intended primarily for parts in the aircraft and atomic energy fields develops good bi-level strength characteristics with aging treatment for 1 hr at 900°F. During aging, contraction of 0.00047 in. per in. occurs. The alloy is said to have better corrosion resistance than ordinary stainless steel and good resistance to stress corrosion cracking.

Use, Application and Problems of Soluble Cores — By Charles W. Schwartz, Misco Precision Casting Co. A hollow investment casting from which cores cannot be retracted readily can be produced by using split section retractable metal cores, split patterns with sections welded or cemented into a whole pattern or by using water soluble wax cores around which the pattern wax is injected. Dissolving away the cores leaves the desired hollow pattern.

The first two methods of producing cored sections should be used if possible. The use of soluble cores is expensive.

Several committee reports were given. Mr. Dubovick reported that work on process materials standards is progressing. Mr. Operhall reported on the success of the investment casting course held last summer at University of Michigan and stated that another course will be held next summer at MIT and will cover a wide variety of topics.

Mr. Waindle stated that work is continuing on specifications for alloys other than those already covered. His committee is waiting for comments from members on the first group of

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Quality-control analytical laboratory for production and research. Simple, rapid operation — forty seconds for complete analysis on dials reading directly in percent concentration. Permanent optical alignment with the Automatic Servo Monitor. Other features include: unique (patented) measuring system . . . plug-in components assuring continuous operation . . . rugged design for plant operation . . . and versatile specimen holders.

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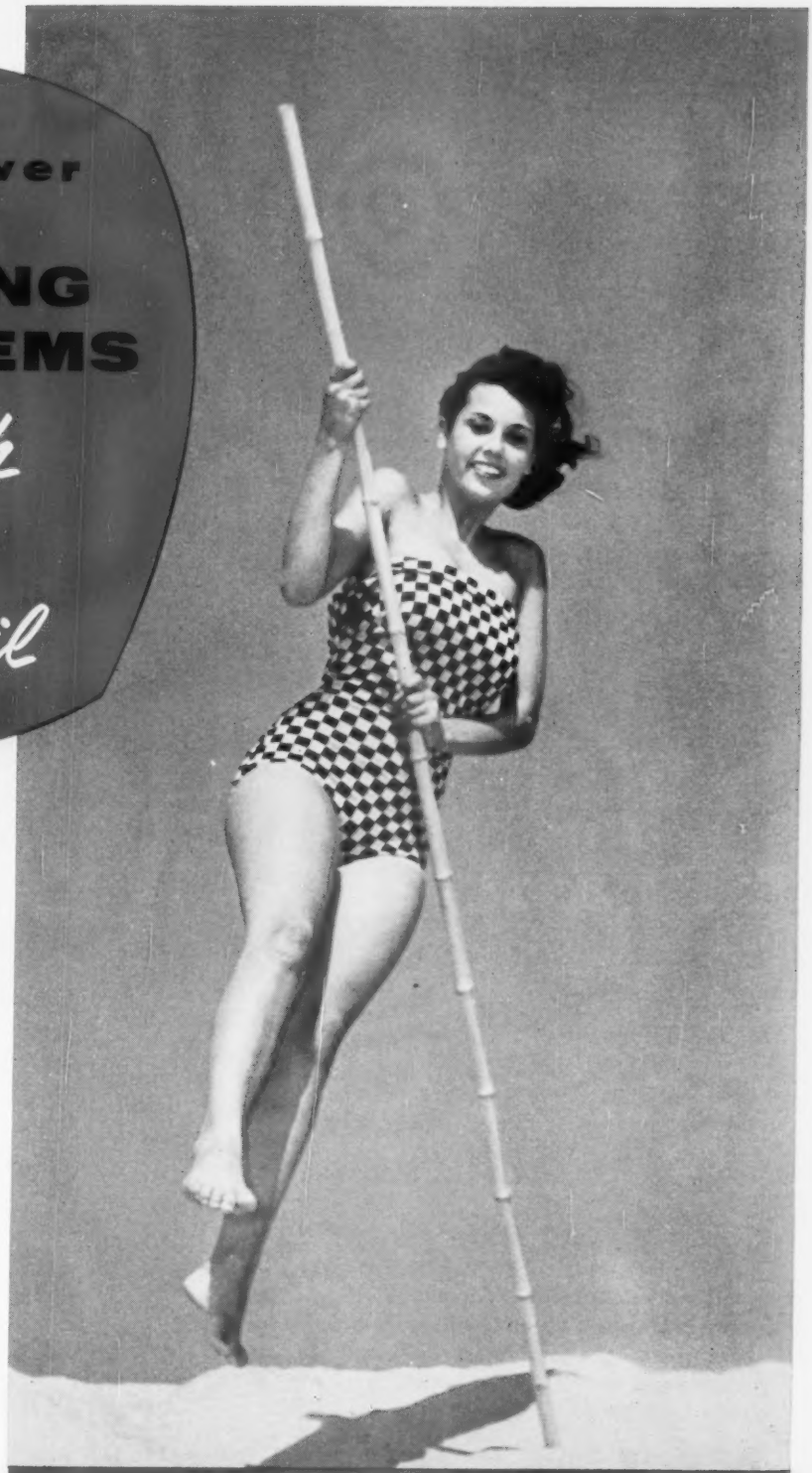

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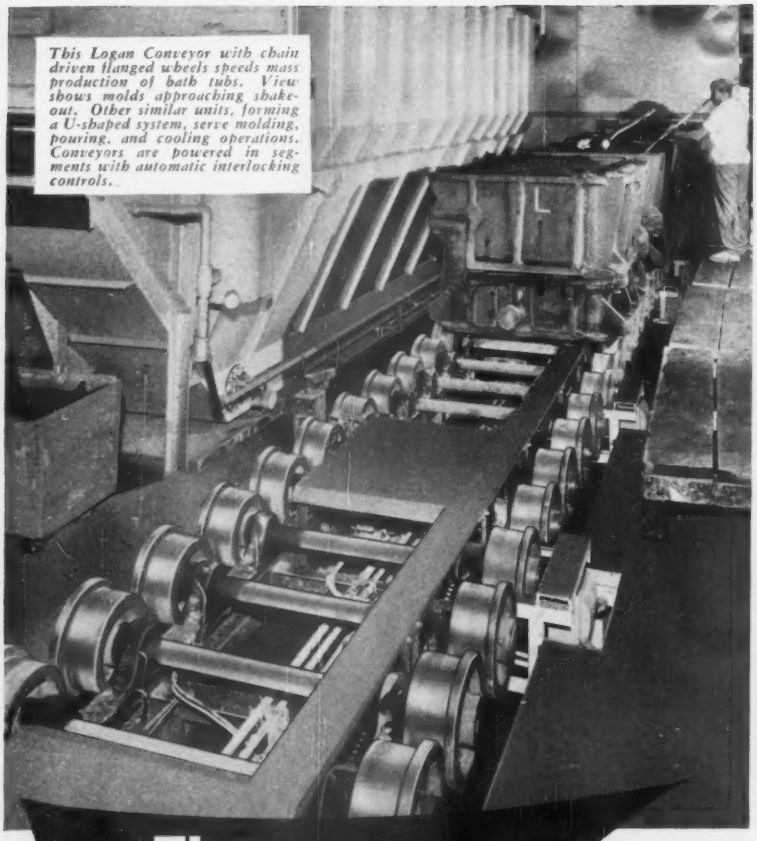

This Logan Conveyor with chain driven flanged wheels speeds mass production of bath tubs. View shows molds approaching shakeout. Other similar units, forming a U-shaped system, serve molding, pouring, and cooling operations. Conveyors are powered in segments with automatic interlocking controls.

The LEADERS use Logan

Leadership, in the industrial world, is closely allied to the use of mass production equipment such as Logan Conveyors. Large plant or small, the "principles" of mass production can be utilized to advantage. Conserving manpower, saving priceless time, increasing plant capacity, maintaining satisfactory working conditions are some of the contributions which Logan Conveyors make to the mass production process. Let Logan work for you, too. Write for nearest engineer or for further information.

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specifications before completing their work.

Vacuum Symposium — In opening the vacuum melting and casting symposium, Dr. Jack Keverian, General Electric Co., Schenectady, N. Y., stated that vacuum melting was first done in connection with work of the Manhattan Project, which had as its major purpose development of the atomic bomb. He sees a trend toward vacuum melting to provide the superior metal components needed to withstand the stress and strain of modern applications.

Vacuum Melting—Past and Future —by Dr. Grant. More vacuum melting capacity existed before World War II (in Germany) than after the war. Postwar developments were slow because early experiments gave the false impression that vacuum melting did not improve metal properties. Tests were confined to those for creep-rupture properties which showed very little improvement over those of air-melted metals.

Vincent Lazzara, left, former institute president, receives plaque from new president, K. W. Thompson

More recent work indicates that vacuum melting is important for degassing metal. The percentage content of oxygen, hydrogen and nonmetallic inclusions is ten times less than in air melting. Nitrogen content is about the same. Vacuum melting permits close control of readily oxidizable and tramp elements. Higher alloy contents are obtainable and close reproduction of alloy composition is possible. Consequently, better metal properties needed to do a job can be achieved. Work on casting parts in a vacuum, however, can progress only as equipment is developed for the purpose.

Influence of Vacuum on Properties of Various Materials—by A. J. Kiesler and W. F. Moore, General Electric Co. Presented by Mr. Kiesler. Most experimental work has been done on wrought materials, but findings also should pertain to cast metal. Much

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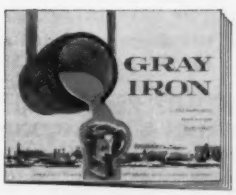

An illustrated brochure on the Gray Iron Industry and its place in the nation's industrial economy. Includes descriptive data on casting practices and the story of the production of Neville Pig Iron and Neville Foundry Coke.

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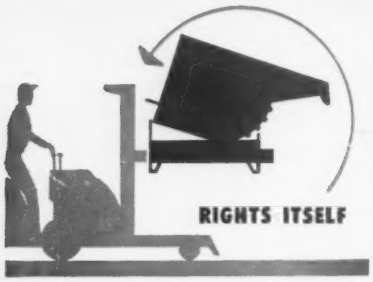

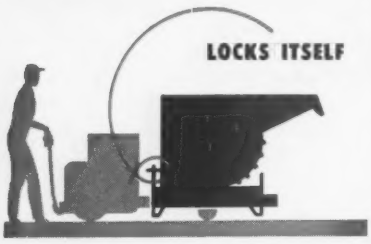

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of the research has been based on a comparison of like metals melted in air and vacuum. Thus any property improvements can be traced directly to the vacuum process. Results show that vacuum melting produces denser metals of more uniform analysis and higher properties.

Copper and nickel offer great opportunities for improvement by vacuum melting. Copper can be produced with electrical conductivity close to the theoretical value.

Equipment and Operational Technology—By J. H. Moore, Vacuum Metals Corp., Syracuse, N. Y. High-frequency induction and indirect arc furnaces are used for vacuum melting. Induction furnaces are most widely used. Crucibles of stabilized zirconia have given best results although alumina is good and magnesia has been used for many alloys.

Vacuum-made ingot is considered best for remelting and casting. More flexibility, however, is obtained on larger furnaces by melting and refining raw materials and pouring several molds in the same furnace. In this way, foundrymen are not confined to vacuum alloys offered by suppliers. If that is done, a booster vacuum pump is required to supplement the regular pump during metal refining.

Refractories and Molding Materials for Vacuum Casting—by H. O. McIntire, Battelle Memorial Institute, Columbus, O. Magnesia or alumina refractories now used for lining melting furnaces appear to be adequate for melting iron, nickel and cobalt-base alloys currently of greatest interest to investment casters. If operating temperatures exceed 2900°F, zirconia may offer advantages over magnesia and alumina because of its greater thermal stability.

Although good castings have been vacuum cast in conventional silica investment molds, there is reason to believe that many alloys may react with silica molds. Consequently, precoatings made with alumina, zircon or zirconia may be needed. Because mold gassing increases when casting in vacuum, a high degree of mold permeability is desirable. Shell type investment molds should permit easier escape of gases than do investment molds made in flasks.

Economics of Vacuum Melting and Casting — by Dr. F. N. Darmara, Utica Drop Forge & Tool Co., Utica, N. Y. Volume of production, efficiency, know-how and quality control generally influence total cost of products. Customer specifications affect comparative costs. Castings made in a vacuum, if they are sold on the basis of service life, usually are cheaper than similar parts which are made in air.

S **SHAMVA** the superior mullite refractory.

H **HIGHEST** quality, pure alumina base.

A **ASSURED** uniform thermal expansion. Excellent load capacity at high temperatures.

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Circle 644 on Inquiry Card—Page 203

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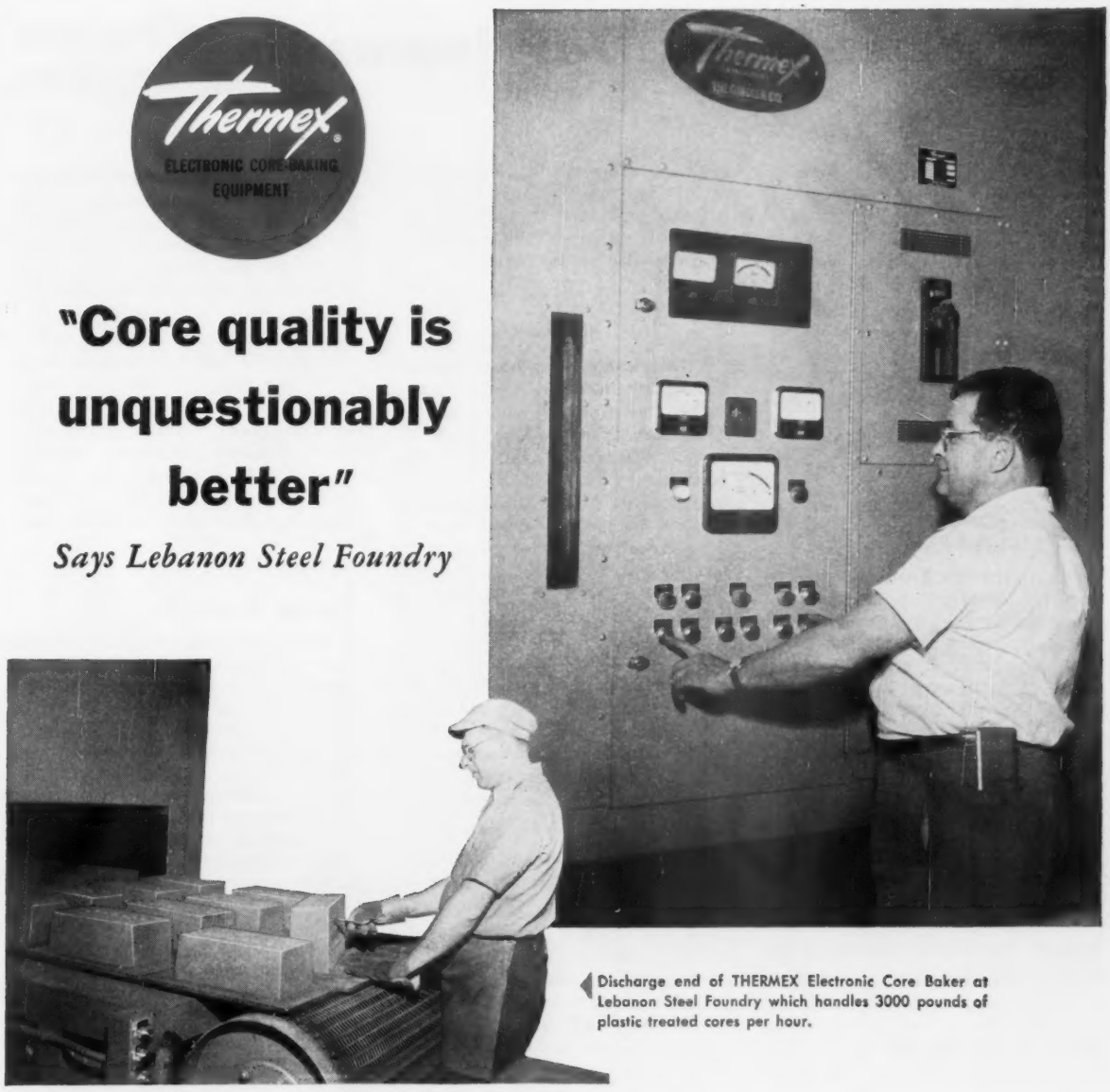
"Core quality is unquestionably better"

Says Lebanon Steel Foundry



Discharge end of THERMEX Electronic Core Baker at Lebanon Steel Foundry which handles 3000 pounds of plastic treated cores per hour.

THIS 75 KW THERMEX* Core-Baking Unit was installed last October in the Lebanon Steel Foundry, Lebanon, Pa. Here's what Philip A. Repino, Plant Engineer, reports on one outstanding advantage proven in the first six months of operation:

"Core quality is unquestionably better. They are dried more uniformly. Scratch hardness and tensile values are higher. Cores are more uniform in size—require less filing and fitting."

This progressive steel foundry also found that electronic baking gives faster, smoother production—at lower cost! Power costs have been reduced from $4.00 to $1.20 per ton. Breakage has been cut to the bone and spraying eliminated. Storage space and rehandling are substantially less.

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A DIVISION OF NATIONAL CYLINDER GAS COMPANY
LOUISVILLE 1, KENTUCKY
THERMEX DIVISION

Foundry Developments

By EDWIN BREMER
Metallurgical Editor

CURRENT research dealing with application of ultrasonics to metal solidification problems—especially in grain refinement of alloys in which ordinary grain refiners are impotent—has led to some interesting results. In yellow brass a 25 per cent improvement in the tensile and yield strengths is reported to have been obtained by use of sonic vibrations. Indications are that similarly significant results will be achieved in other metals and alloys when the work is completed.

Shell Molded Rings

TURBOSUPERCHARGER nozzle rings for use in diesel engines where high temperature of exhaust gases is a major factor, are being produced by shell moldng. Developed by engineers of Allegheny Ludlum Steel Corp., the practice employs shell molds with ring-shaped cavities in cope and drag. Prefabricated stainless steel vanes are placed in the drag half and held accurately in position by a slotted ring core. After placement of the cope mold, stainless steel is cast around the inner edges of the vanes. Outside diameter of the nozzle ring hub is cast to a finish size between 0.000 to plus 0.020-in. tolerance with ⅛-in. to finish on the face.

Effect of Hardeners

RESULTS of an investigation on the effect of hardening elements—molybdenum, columbium, aluminum, titanium, boron, carbon and zirconium—on the high-temperature properties of vacuum-melted alloys now are available. These alloys have a base composition of 60 atomic per cent nickel, 20 atomic per cent chromium, 10 atomic per cent cobalt and 10 atomic per cent iron. Stress rupture properties at 1600°F were found to depend on 1) the vacuum obtained during melting, 2) fabrication methods, and 3) total amount of hardener. It was concluded that a higher level of strength was more likely to occur at a given hardener level when a greater variety of hardening elements was added. Information is contained in "Investigation of the Effects of Incongruous Elements and the Interaction Effects of These Elements on High Temperature Strength of Fe-Co-Ni-Cr Alloys" by Robertshaw and Richmond. It is designated PB 121379 and available from Office of Technical Services, Washington 25, for $1.75.

Can Watch Movement

NEW technique for observing motion of tiny defects in crystalline materials may result in metals and alloys many times stronger than the best commercially available today. Described by Drs. Gilman and Johnston, General Electric Research Laboratory, in the September issue of the *Journal of Applied Physics*, the technique involves etching crystals of lithium fluoride with a special acid reagent. Procedure reveals atomic imperfections called "dislocations," which can be photographed and which are believed to hold the key to the strength of metals and ceramics. When a piece of steel stretches or fails in service, dislocations are thought to be moving inside the invidual crystals of the metal.

Vacuum Melting

NEW consumable electrode vacuum arc furnace is being installed at Universal Cyclops Steel Corp., Bridgeville, Pa., for development of high-temperature metals and alloys. Initial work will be in molybdenum. The furnace also can be used for titanium, zirconium, and nickel or iron-base alloys. Designed and constructed by General Electric Co., the vacuum arc furnace is rated as a 12-in. unit, but will handle 8, 10 and 16-in. diam ingots with a maximum length of 5½ ft, and weighing from 850 to 5000 lb. Unit will produce a 2000-lb ingot every 5 hr, which includes 2 hr melting time and 1½ hr each for ingot removal and preparation of the furnace.

Aid for Development

CANCELLATION of the quota system on six critical materials by the Department of Defense apparently will open a whole new field of research in high-temperature alloys for use in jet aircraft. Materials are tungsten, cobalt, chromium, columbium, nickel and molybdenum. R. H. Thielemann, director of research program on high-temperature alloys sponsored by the Tungsten Institute at Stanford Research Institute, points out that lifting of the restrictions on tungsten permits incorporation of greater amounts of that material in developing new alloys. Future goal for high-temperature alloys is in the 1800 to 2000°F or even higher temperature range, according to Thielemann. Reaching the ultimate goal will necessitate development of a tungsten-base alloy or one using 50 per cent or more of tungsten, and such work is under way.

Curing Blowholes

OCCURRENCE of small subsurface blowholes in association with manganese segregation and slag-like inclusions was investigated by W. G. Tonks and described in the June 1956 issue of the *Journal of Research and Development* (Birmingham, England). The defect was reproduced experimentally, and it was found that low pouring temperature is the chief contributing factor. At a given pouring temperature the product manganese content times sulphur content of the iron has a critical value which, when exceeded, favors the occurrence of the subsurface blowholes. From a practical point of view it appears that control of pouring temperature and possibly the manganese content would be easier for the foundryman than controlling the sulphur content.

Refines the Iron

IN A continuing study of "Heredity of Pig Iron," Iitaka, Nakamura and Kikuchi investigated the effects of bubbling oxygen, hydrogen and argon through the iron and found beneficial results with argon and hydrogen but not with oxygen. Bubbling hydrogen through a native pig iron, which required considerable magnesium to produce nodular or spheroidal cast iron, resulted in an appreciable reduction in the amount of magnesium. As reported in the *Report of the Castings Research Laboratory*, No. 7, 1956, of Waseda University, Tokyo, Japan, the authors indicate that hydrogen reduces the sulphur and oxides in the pig iron.

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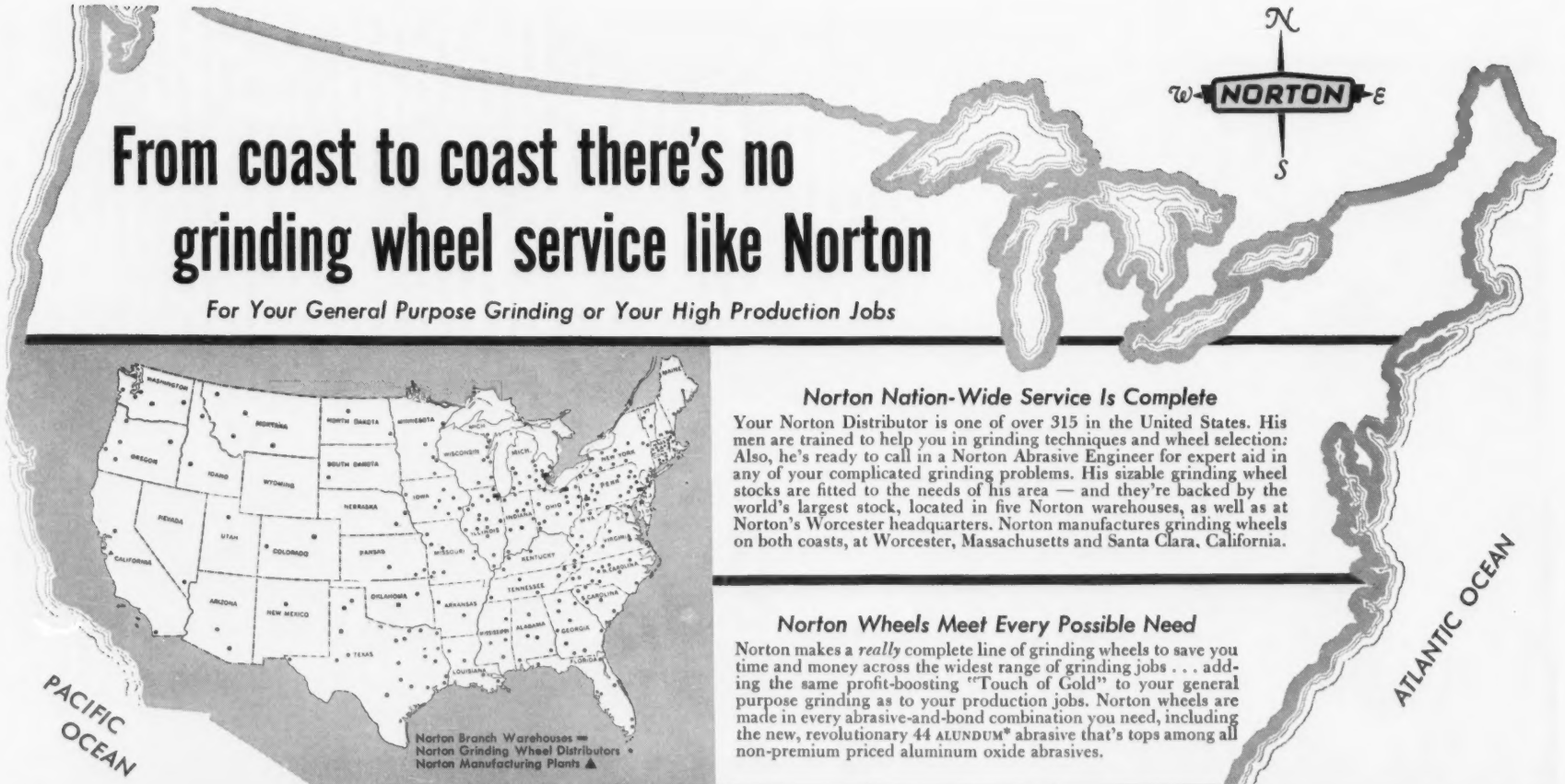

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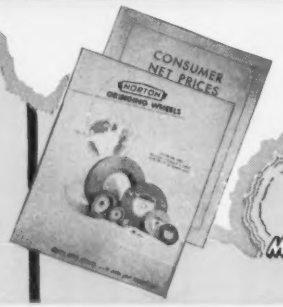

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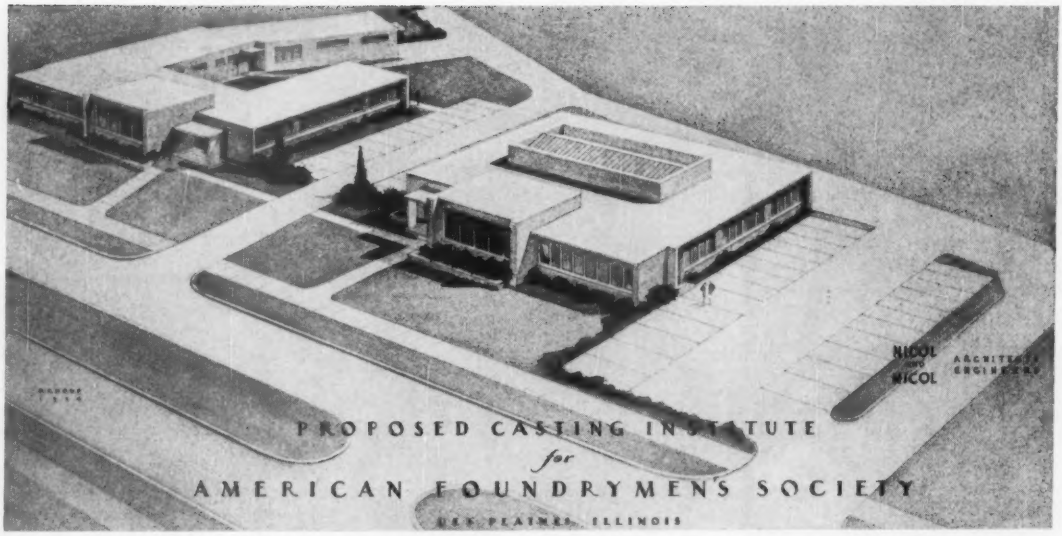


Foundry Training Center is on right. AFS Headquarters is building on left

AFS Launches New

TRAINING and RESEARCH PROGRAM

CONSTRUCTION of a new Foundry Training Center for intensive job training of foundry personnel was approved Nov. 16 by the directors of the American Foundrymen's Society.

At the same time the society announced formation of a Training and Research Institute, as a foundation to advance the educational and scientific objectives of the organization, and elected trustees to head the new activity.

The six-point program approved by the directors includes:

1. Construction of the institute building to house the Foundry Training Center, and development of short, intensive refresher courses for foundry personnel.

2. Continuation of the annual Foundry Instructors Seminar for instructors in foundry and patternmaking at high schools and vocational schools.

3. Development of AFS "field programs," including summer short courses and regional technical councils.

4. Broadening of AFS research on fundamental foundry problems at research institutions and at the institute building.

4. Future development of a program of scholarships for high school graduates, to encourage enrollments in engineering colleges.

6. Development of the Training and Research Institute as an industry-owned and industry-operated foundation to meet the educational and technological requirements of the castings industry.

To Build at Des Plaines—The Training Center will be the first such school in America owned and operated by the industry to provide foundry job training. It is to be erected on the site of the society's present headquarters building in Des Plaines, Ill., suburb of Chicago. The project will be financed by the society and industry.

In announcing the society's broad program, Frank W. Shipley, foundry manager of Caterpillar Tractor Co. and AFS president, stressed the industry's need for trained personnel to produce the greatly increased tonnages of cast metals expected in the years ahead. "Our industry," he said, "anticipates a 25 to 30 per cent increase in castings demand over the next 25 years. To meet this challenge, our industry must have better trained men.

"The new Training Center will help bridge the present tremendous gap between the boys who enter the industry from the high schools and vocational schools and those who come to us from engineering colleges and universities. No industry-wide facilities now exist for upgrading and intensive training of line and middle supervisors, the key men in all foundry production. In-plant trainee and apprentice programs are relatively few, due to high cost and lack of means and personnel in many individual plants."

To Cover Fundamentals—The plan is to offer a year-round series of short (one or two weeks) intensive courses in such fundamentals as foundry sands, melting materials and methods, molding and core sands, foundry safety and environmental control, patternmaking methods and materials, materials handling techniques, and laboratory control procedures. Every course will be practical and concentrated, with instructors from industry, educational institutions and the society's own staff.

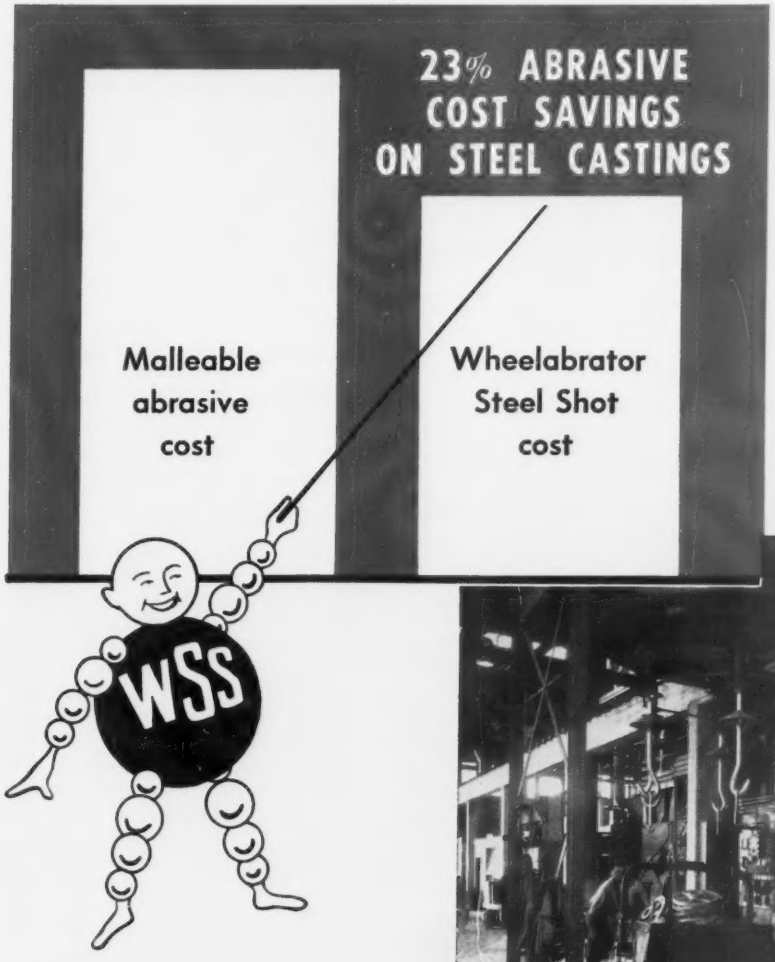
The new foundation will be financed by the society and the Training Center building eventually will be given permanently to the foundation. The building is expected to be completed early in 1958. Plans contemplate broadening of the industry's present research on fundamental foundry problems, utilizing facilities of the new building and of prominent educational and research institutions.

As announced by the society's

WHEELABRATOR® STEEL SHOT

Saves $8,000 a year for Crucible Steel Casting Co.

Wheelabrator Steel Shot has proved most economical in cleaning steel castings at crucible Steel Castings Co.! Tests made in a 3-wheel Wheelabrator Monorail Cabinet showed these results: In 322 hours, the 3 wheels consumed over 19,000 lbs. of malleable abrasive for an abrasive cost averaging $1.578 per wheel hour for each wheel. In 202 hours, the machine used approximately 6,800 lbs. of Wheelabrator Steel Shot for an average abrasive cost of $1.215 per hour for each wheel. This means savings of $.363 per hour for each wheel. The Milwaukee steel foundry operates 10 wheels a total of 100 hours each day, so daily abrasive savings add up to approximately $36.30 — or about $8,000 annually. You, too, can save with Wheelabrator Steel Shot, the low-cost answer to cleaning problems.



Test Machine

The findings reported above resulted from tests conducted in the Wheelabrator Monorail Cabinet shown below. This is only one of several airless blast cleaning machines operated by Crucible Steel Castings Co. to clean the wide variety of castings produced.

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What makes it so? Well, the making of Tru-Steel is our only business; we make no other type of shot for sale. Tru-Steel is our bread and butter -- we **have** to make it **good.** Modern, unexcelled melting, heat-treating and laboratory-control equipment, **plus** top-notch metallurgists who know shot making as no others do, make Tru-Steel the product of specialists. Isn't it reasonable that it should be better?

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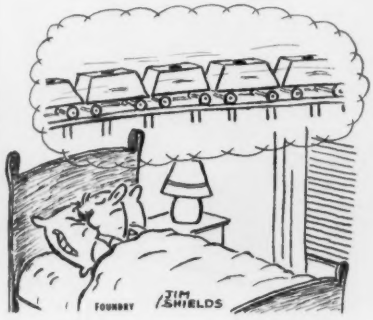
president, the institute's program also will include the following: A series of seminars for high school and vocational school instructors in foundry and patternmaking, to encourage enrollments in engineering colleges and foundry careers; assistance for secondary school graduates desiring to enter engineering universities; summer short courses at major universities for foundry personnel; and a series of annual regional technical councils throughout the country to bring latest technical developments and techniques to thousands of foundrymen in their local plant areas.

Trustees Named—The institute will be directed by a board of trustees consisting of the incumbent president, vice president and immediate past president of AFS, plus members selected from industry for four-year terms. Present trustees include Mr. Shipley; Harry W. Dietert, Harry W. Dietert Co., Detroit; Bruce L. Simpson, National Engineering Co., Chicago; Dr. G. H. Clamer, Ajax Electrometallurgical Corp., Philadelphia; I. R. Wagner, retired president, Electric Steel Castings Co., Indianapolis; Hyman Bornstein, retired director of laboratories, Deere & Co., Moline, Ill.

Recognizes Help Given to British Iron Foundries

At the annual dinner of the Joint Iron Council, held in London, England, Nov. 6, N. P. Newman, president, presented an illuminated address to Winthrop G. Brown, director, United States Operations Mission in London. It was given in appreciation of help afforded by funds made available under Conditional Aid to promote technical training in iron founding and research in subjects concerning health, safety, productivity and fuel economy. Mr. Brown also was presented a pair of fruit plates especially cast from an old pattern at the Coalbrookdale foundry of Allied Ironfounders Ltd.



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Circle 649 on Inquiry Card→

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This is another indication of the unusual facilities to be found at City Pattern Foundry & Machine Co. for the crafting of the finest in metal patterns and other foundry equipment. Such facilities, manned by experienced hands, are your assurance that a pattern bearing this name has been produced accurately and by the most practical and economical modern methods. These "stand-out" facilities, coupled with conscientious effort to produce the best in patterns, are the very reasons that leading manufacturers rely on City Pattern Foundry & Machine Company for patterns that stand out in use.

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Industry Briefs

OHIO FERRO-ALLOYS CORP., Canton, O., will build a new $3 million plant near Clarington, O., on the Ohio River. Incorporating three large electric furnaces, the plant will produce silicon alloys. Ohio Ferro-Alloys produces a full line of silicon, manganese and chromium alloys and also operates plants at Philo, O., Tacoma, Wash., and Brilliant, O.

Pennsylvania Malleable Iron Corp., Lancaster, Pa., has started construction of a new $600,000 foundry at Landisville, Pa., about 5 miles from Lancaster. The one-story, 100 x 350 ft plant will include a foundry, cleaning and sorting rooms, annealing and shipping department, and office and washroom facilities. It is expected to be in full operation by April 1 and will employ about 125 men initially. Operations will be continued at the Lancaster foundry. Lack of room to expand capacity at that location dictated the new construction at Landisville.

Austenal Inc., New York, has ordered a number of vacuum casting furnaces, designed specifically for use in investment casting, for plant installation early in 1957. Austenal has had pilot facilities in operation for two years and will use the new furnaces for production. Manufacturer of the new units is F. J. Stokes Corp., Philadelphia. Austenal and Stokes designed the furnaces jointly.

Norton Co., Worcester, Mass., recently dedicated its newly completed electric furnace plant at Huntsville, Ala. The new plant will produce various electric furnace materials including boron carbide, fused zirconia, fused magnesium oxide, and fused alumina. Facilities to make aluminum oxide and silicon carbide may be added later.

Metal & Thermit-United Chromium of Canada Ltd. has completed construction of a combined office, warehouse and manufacturing facility on Factory Street in the Highbury area of Etobicoke Township in northwestern Toronto. Products of the plant will include chromium, copper and nickel plating materials; liquid dips; organic protective coatings; and welding compounds.

U. S. Industrial Chemicals Co., division of National Distillers Products Corp., New York, has taken an exclusive option on a process for separating hafnium from zirconium chloride. The process, developed by the Commonwealth Scientific and Industrial Research Organization, Australia, is a cost-saving step in the production of zirconium.

Link-Belt Co., Chicago, will build a new plant in Montebello, Calif., about 10 miles east of downtown Los Angeles, to replace and expand its facilities at 361 South Anderson St., Los Angeles. Ground will be broken next spring, and it is expected that the 90,000-sq-ft plant will be in operation by November, 1957.

Aluminum Industries Inc., Cincinnati, has acquired Wisconsin Machinery & Mfg. Co., Milwaukee, manufacturer of gray iron pistons, cylinder sleeves and aluminum pistons. It will operate as a division of Aluminum Industries, with O. W. Brown, vice president of Wisconsin Machinery, as general manager.

Clark Bros. Co., Olean, N. Y., a division of Dresser Industries Inc., Dallas, Tex., has undertaken a $2,700,000 expansion program for 1957. The program calls for foundry equipment, new tools and a welding shop. Clark produces compressors for oil and gas transmission lines and gas turbines.

C & S Products Co. is moving into new and larger quarters at 18656 Fitzpatrick, Detroit 28. Phone, Broadway 3-1230. Enlarged facilities will be available for the manufacture and engineering of shell core and mold blowing equipment.

Baker-Raulang Co., Cleveland, has named Shafer Industrial Equipment Co., 1800 North 72nd St., Omaha, Nebr., to handle its complete line of gas and electric industrial trucks.

BEGINS RESEARCH CENTER: Speer Carbon Co., St. Marys, Pa., recently began construction of a new research and development center at Niagara Falls, N. Y. In the view above, Andrew Kaul III, Speer president, is breaking the ground for the 23,000-sq-ft facility, which is scheduled for completion in the fall of 1957. Also present at the ceremonies were, left to right, Lawrence M. Liggett, manager of research; George J. Fehrenback, vice president-treasurer; Thomas H. Way, vice president-manufacturing; Edward W. Butler, vice president-sales; and Robert L. Womer, vice president-technical director

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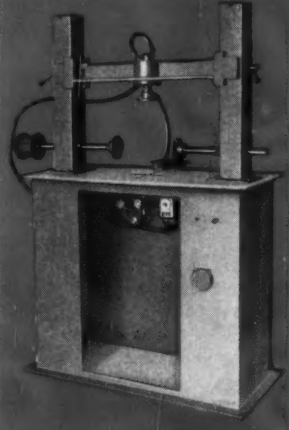

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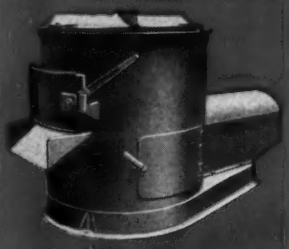

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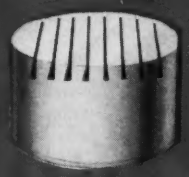

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the original CO_2 sand binder, is the Standard of Quality and comparison throughout the world. Hardens fast, produces harder cores, less gas evolution and shakes out better. Made in several special grades to save our customers money and improve quality!

Shafer will be the company's dealer for Nebraska, southwest South Dakota and western Iowa.

Metal Treating Institute reports October billings by member companies of $3,442,300, an increase of 18.8 per cent over a year ago. Billings for ten months of nearly $31 million were 24 per cent ahead of the 1955 period.

Tincher Products Co., Milwaukee, a division of Ideal Industries, Sycamore, Ill., has changed its name to Imprex Division. It manufactures equipment used to eliminate porosity in pressure castings.

American Brake Shoe Co. is entering the specialty aluminum casting business. Limited production has been under way for about a year, and a new commercial foundry is being built at Mahwah, N. J.

Electro Refractories & Abrasives Corp., Buffalo, has appointed Enos & Sanderson Co., 147 Bushnell, Buffalo, to be its distributor in western New York.

Lindberg Engineering Co., Chicago, has opened sales offices at 146 University Ave., Rochester, N. Y., with Earl G. Olsen as manager. Activities of the Buffalo office will be relocated at the new facilities.

Republic Steel Corp., Cleveland, has appointed Northwest Materials Handling Co., Pascal & Roblyn, St. Paul 4, Minn., to handle sales and distribution of its line of material handling equipment.

Hydair Cylinder Corp. has been formed to produce air and hydraulic cylinders, boosters, accumulators and other equipment. The company is situated at 5755 South Pennsylvania Ave., Cudahy 7, Wis. Jack Modrich is president.

Thor Power Tool Co., Aurora, Ill., has opened a new branch office in Indianapolis, its 26th. Providing sales and service facilities for southern Indiana and western Kentucky, it is directed by Richard E. James Jr.

Booket Aids Safety Programs

Government publication entitled *Safety Subjects* is a practical aid which should be of interest to anyone with a safety responsibility. Now printed in a revised and expanded edition, it covers such topics as accident costs and causes, responsibility of management, accident reports and records, safety standards, protective equipment, machinery safeguarding and material handling. Copies are available from the U. S. Government Printing Office, Washington 25, for $1 each.

Designations for High-Alloy Castings Revised by ACI

The latest revision of the list of standard designations and chemical composition ranges for heat and corrosion resistant cast alloys has just been issued by the Alloy Casting Institute, Mineola, N. Y.

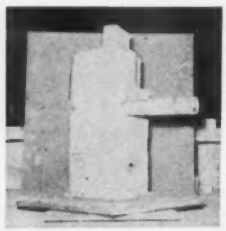
Noteworthy is the addition of two new cast alloys of the "18-8" variety, with very low carbon contents. Used in some service as alternates to the columbium-stabilized grade, or for especially severe corrosive conditions, these alloys bear the designations CF-4 and CF-4M. Nominally, these grades correspond to the wrought types 304L and 316L, respectively.

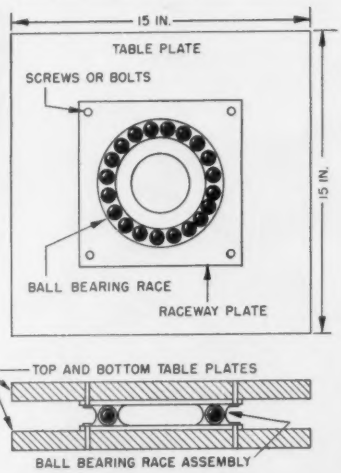
In addition, the free-machining grade CF-16Fa has been reinstated to the ACI standard designation list. Containing molybdenum and sulphur, this grade provides an alternate to the selenium-containing type CF-16F cast high alloy. Copies are available from ACI headquarters.

HOW TO DO IT

Revolving Table Saves Time, Labor In Rubbing and Pasting Cores

By HAROLD O. WAGONER
St. Louis, Mo.



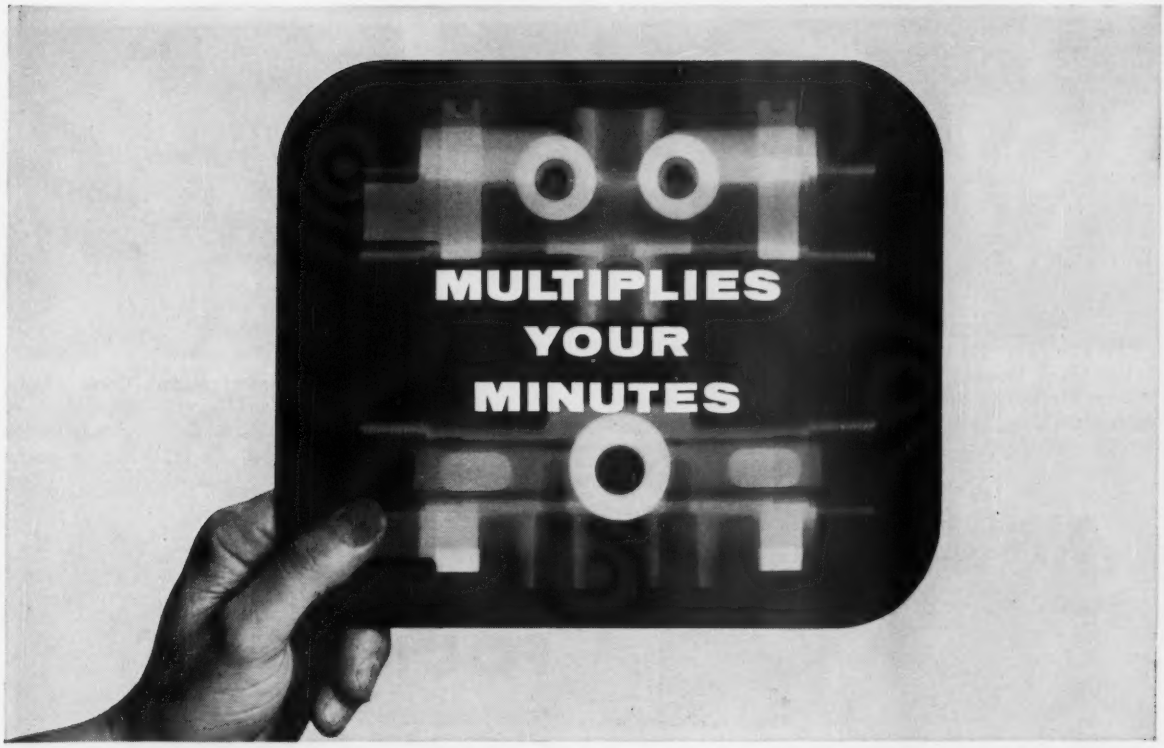


LAZY SUSAN type revolving table saves time and labor in rubbing and pasting cores. It also may be used to hold castings during inspection. The table is a simple device consisting of a standard ball bearing race assembly mounted at the center of two square or round pieces of plywood, plate steel or aluminum. One piece forms the base and the other the top of the revolving table. A foam rubber cushion with durable covering can be glued to the table top to minimize damage to cores placed on the table.

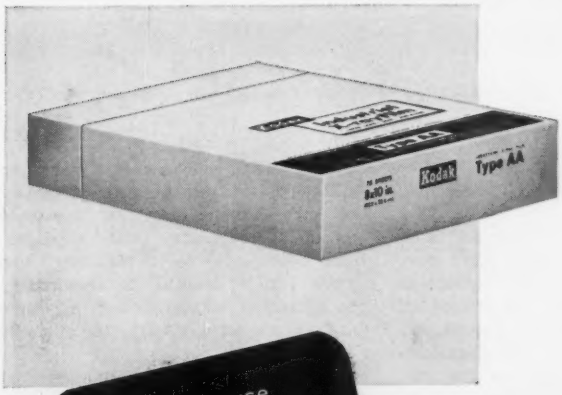
Race assemblies are available in several standard sizes. They consist of two square steel plates with a hole in the center surrounded by a stamped circular raceway. The top and bottom plates each have small holes at the four corners to permit screwing or bolting the ball bearing race assembly to the wood or metal plates forming the top and base of the revolving table.

The sketch shows construction detail of a 15 x 15-in. table, and the photograph shows a core on the table. Seven operations were performed on the core without lifting it. The board behind the core is for photographic purposes only.

Do you have any tricks of the trade tucked away with your foundry experience? Why not release them to fellow foundrymen? FOUNDRY will pay a minimum of $15 for each idea submitted and published. Send a photo or drawing with your idea



New Kodak Industrial X-ray Film, Type AA



When you're faced with the need for quantities of high-quality work, Kodak's new Industrial X-ray Film can be an outstanding find.

Because of its greatly increased speed, exposure times can be cut, and more production realized with existing x-ray equipment and gamma ray sources.

While this new film ranges up to more than twice as fast, it still has the fine sensitivity characteristics which made Kodak Type A the most widely used x-ray film in industry.

Kodak Industrial X-ray Film, Type AA, extends the service of present radiographic equipment, saves time, produces quality results. Have your x-ray dealer or Kodak Technical Representative show you how.

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Read what the new Kodak Industrial X-ray Film, Type AA, does for you:

- Reduces exposure time—speeds up routine examinations.
- Provides increased radiographic sensitivity through higher densities with established exposure and processing technics.
- Gives greater subject contrast, more detail and easier readability when established exposure times are used with reduced kilovoltage.
- Shortens processing cycle with existing exposure technics.
- Reduces the possibility of pressure desensitization under the usual shop conditions of use.

Kodak
TRADE-MARK

Left, William Dawson, Ford Motor Co.; E. F. Chojnowski, Albion Malleable Iron Co.; R. A. Colton, Federated Metals Division; Dick Kropf; Jess Toth, Harry W. Dietert Co.; Prof. C. C. Sigerfoos, Michigan State University, and Bob Thomson, General Motors Corp. Right, C. L. (Biggie) Munn, Michigan State University; Harry E. Gravlin Jr., Claude B. Schneible Co., and Bob Dodge with Keith Millis, International Nickel Co., in center

Dick Kropf, International Nickel Co., and Bob Dodge, Archer-Daniels-Midland Co.

MICHIGAN FOUNDRY CONFERENCE

Looks at Casting Processes

By EDWIN BREMER
Metallurgical Editor

WITH an attendance of 300, the Michigan Regional Foundry Conference conducted a successful two-day meeting Nov. 29-30 at the University of Michigan, Ann Arbor, Mich. Sponsored by the university and the AFS chapters of Saginaw Valley, Western Michigan, Central Michigan, Detroit, University of Michigan and Michigan State University, the theme of the conference was "New Casting Processes and New Fields for Castings." In addition to three technical sessions, the meeting included two luncheons and a dinner.

Welcoming those in attendance, Robert D. Dodge, Archer-Daniels-Midland Co., Detroit, turned the meeting over to the technical chairman, Anton Dorfmueller, Archer-Daniels-Midland Co., Cleveland, who introduced the speakers.

First on the program was Elmer E. Braun, Central Foundry Division, General Motors Corp., Saginaw, Mich., who discussed **The Development of the Shell Cast ArmaSteel Crankshaft.** He stated that in 1940 some work was carried on with the view of converting forged crankshafts to a cast product. Core molds were used, but high cost caused the practice to be abandoned. With the advent of shell molding, experimental work was begun in 1952 with ArmaSteel, a pearlitic malleable iron, as the material for the crankshafts. Nearly two years were spent in solving the numerous metallurgical, production, and inspection problems, and commercial production on a sizable scale began in 1954. Details on methods employed were presented in "Casting Crankshafts in Shell Molds" in the May, 1956, FOUNDRY.

Evaluation and Quality Control of Core Oil by Wayne H. Buell, Aristo Corp., Detroit, described a procedure for tensile testing to obtain the maximum information on properties and uniformity of core oil with minimum time and labor. Pointing out that the conventional method for plotting tensile strength versus oven time for oil and cereal bonded cores requires a long time and extreme care, he stated that since the user primarily is interested in how fast the core bakes, approximate peak strength, and resistance to overbaking, the work can be simplified considerably by selection of three sets of time and temperature data for the oil to be tested.

For fast-baking oils he suggested

M. F. Garwood, Chrysler Corp., was speaker at the luncheon on Thursday

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but motor car manufacturers unanimously choose

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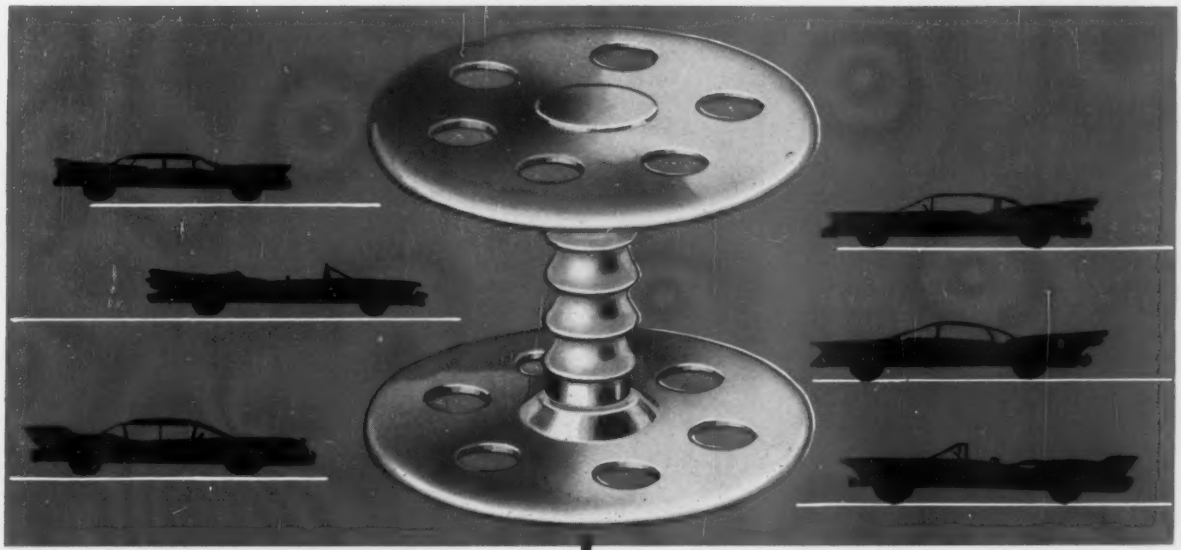

The tremendous flow of uniform, sound castings necessary to the automotive industry must be maintained with no sacrifice in quality. That's why more Fine FANNER motor chaplets have been used by more producers of automotive castings than all other types combined.

Fine FANNER motor chaplets with their exclusive designs, their positive core support, accuracy of production and their complete fusion help produce better, sounder castings at lower cost.

Prevent costly product failures due to unsound castings by using fine FANNER motor chaplets for all your requirements.

Only a few of the wide range of motor chaplets made by FANNER are shown here — get acquainted with the complete line by writing today for your free copy of the FANNER Chaplet Catalog.

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Qualified and specialized engineers in Fanner's Technical Service Division are available for consultation, without obligation, on problems of producing more intricate castings; developing increased strength, closer tolerances, and better quality; reducing machining and improving finish — both in ferrous and non-ferrous castings. Take advantage of the research and development work that Fanner has invested in this field to improve your profit picture! Simply direct your request to the address shown below.

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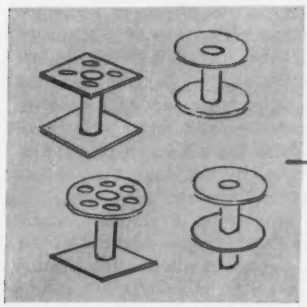
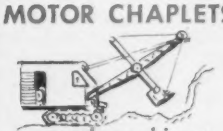
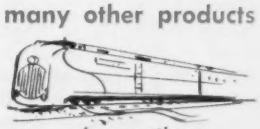


there are fine FANNER MOTOR CHAPLETS for many other products . .

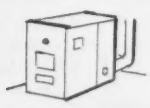
pumps



road machinery

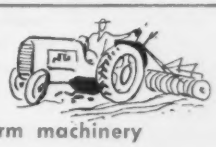


locomotives



furnaces

stoves



farm machinery

45 minutes at 350° F, 45 minutes at 400° F, and 105 minutes at 450° F, and for slow-baking oils 45 minutes at 400° F, 75 minutes at 425° F, and 120 minutes at 450° F. The testing must be conducted with a standard core oil baked in the same oven at the same time and in the same location to be conclusive.

Diaphragm Molding by Louis J. Pedicini, Process Development Section, General Motors Corp., Detroit, began with some early history of the use of a flexible diaphragm for compacting sand on a pattern. He described some experimental work conducted about eight years ago, and then presented information on investigations using a commercial machine.

One experimental arrangement was location of the diaphragm head over the stripping frame of a jolt-squeeze machine alongside of a core blower. Sand was blown into the flask, which then was moved to the diaphragm unit and squeezed. Flask then was stripped from the pattern, moved to a conveyor, and the pattern returned to the blowing unit. While the operation showed no distinct advantage in uniformity of mold hardness due to blowing the sand into the flask, it reduced depth of the impression left by the diaphragm which could eliminate need for deep cope flasks in some applications, and completely eliminated sand spillage.

Some advantages of diaphragm molding include more uniform hardness of mold surface on horizontal and vertical surfaces, good surface finish, uniform casting weights, no need for heavy foundations, low maintenance cost and reduction of noise.

Limitations include need for much stronger and dimensionally accurate flasks, flasks must be deeper or upset frames used, patterns must not be mounted too closely together or too close to the flask wall, and variable diaphragm life. For high production, mold or flask handling equipment must be engineered adequately and carefully.

At the luncheon, with Prof. Richard A. Flinn, University of Michigan presiding, M. F. Garwood, Engineering Division, Chrysler Corp., Detroit, spoke on **Castings' Destiny in the Automobile of Tomorrow.** The interdependence of the automotive and foundry industries is illustrated by use of castings which in 1955 constituted 56 per cent of the malleable iron produced, 25 per cent of the gray iron, 71 per cent of the permanent-mold aluminum, 43 per cent of the aluminum die castings, 60 per cent of the zinc die castings, 38 per cent of the magnesium die castings, and an appreciable amount of the nodular iron.

Improvements in cast materials and processes have had much to do with the continuing relationship between the two industries, the speaker pointed out, citing numerous replacements of wrought parts by castings, changes from one type of casting to another, and increasing use of light metal castings in automobiles. Reviewing briefly the possibilities of ferrous and nonferrous castings produced by various methods, Mr. Garwood urged foundrymen to exert every effort to provide castings with uniform properties and close dimensional tolerances. In closing he stated, "The automotive industry expects great things from you foundrymen in the future. We believe we are justified, for your past performance has set the precedent. We know you are alert to your future in our industry, and we know you are equal to the occasion and will not let us down."

In the afternoon session with Prof. Charles C. Sigerfoos, Michigan State University, presiding, William Dawson, Ford Motor Co., Dearborn, Mich., discussed the **Basic-lined Water-cooled Cupola.** Unit is 102 in. ID without any refractory above the melting zone. Shell is straight down to the melting zone where it is expanded or offset to permit installation of the carbon refractory. Four water-cooled tuyeres project in 10 in. from lining, and have a cross-sectional area of about 6.2 per cent of the diameter. Water cooling is accomplished with a ring of jets just below the charging door which feed into a collar or weir surrounding the cupola. Water flows from the weir onto and down the shell.

The cupola is operated 20 hours a day for two weeks or ten working days. Between shifts and over the week-end, metal and slag are drained completely from the cupola, some coke is added and the unit held in stand-by condition. At resumption of operation the air is turned on for a few minutes to blow out any accumulated ash, the bed is built to the proper height and charging is commenced.

"That Jordan . . . Lives foundry, thinks foundry and even eats foundry."

With the carbon lining the cupola can be operated under slags ranging from basic to acid which may be adjusted to obtain iron of desired composition from a wide variety of raw material charges. While close control of charging and tapout is required in either acid or basic operation, it is somewhat critical when conditions are neutral.

The cupola requires high-quality coke of large size for best results. Coke consumption is relatively high as indicated by 1000 lb coke per 5000-lb iron charge for water-cooled cupola, compared with 600 lb coke for the same iron charge in a conventional unit. Refractory and maintenance costs for the water-cooled unit are about one-twelfth those for the conventional cupola. Iron of any desired composition can be produced from a wide variety of raw material charges by adjusting operating conditions.

Malleable-base Spheroidal Iron by E. F. Chojnowski, Albion Malleable Iron Co., Albion, Mich., indicated that during some investigations on nucleation of primary and secondary graphite in hypoeutectic irons, certain elements previously considered detrimental actually improved properties of malleable iron when present in large quantities. One of these elements is sulphur.

Research has shown that sulphur changes the "popcorn" graphite shape to a true spherulitic type; it also improves the mechanical properties of malleable-base iron. Mottling tendency has been eliminated by sulphur additions even with higher silicon levels.

Malleable-base spheroidal iron, termed "Spherasteel" by the firm, has been produced successfully by direct melting or by ladle additions. In the direct method, steel, iron, coke, ferrosilicon, limestone and sulphur-bearing materials are melted in the cupola and poured into castings. With moderately large pieces of sulphur-bearing materials, loss of sulphur is not noticeable. With the ladle addition method, sulphur-bearing material and ferrosilicon are added to malleable iron in the ladle or to the stream flowing from the air furnace. Iron is heat treated by the conventional anneal, quench and draw processes.

Since sulphur is a strong carbide stabilizer, it has a pronounced effect on second-stage graphitization, resulting in a uniform matrix of spher-

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oidized cementite free of carbon-depleted areas surrounding the graphite. Material has comparatively high yield and tensile strengths and ductility for a given hardness. Machinability is excellent at high strengths, and modulus of elasticity is 25 to 27 million psi.

Concluding paper, **Modern Nonferrous Practice** by Robert A. Colton, Federated Metals Division, American Smelting & Refining Co., Newark, N. J., stated that successful production of aluminum-base and copper-base castings requires awareness of the significant factors involved and diligent attention to minimizing the many variables found in normal foundry practice.

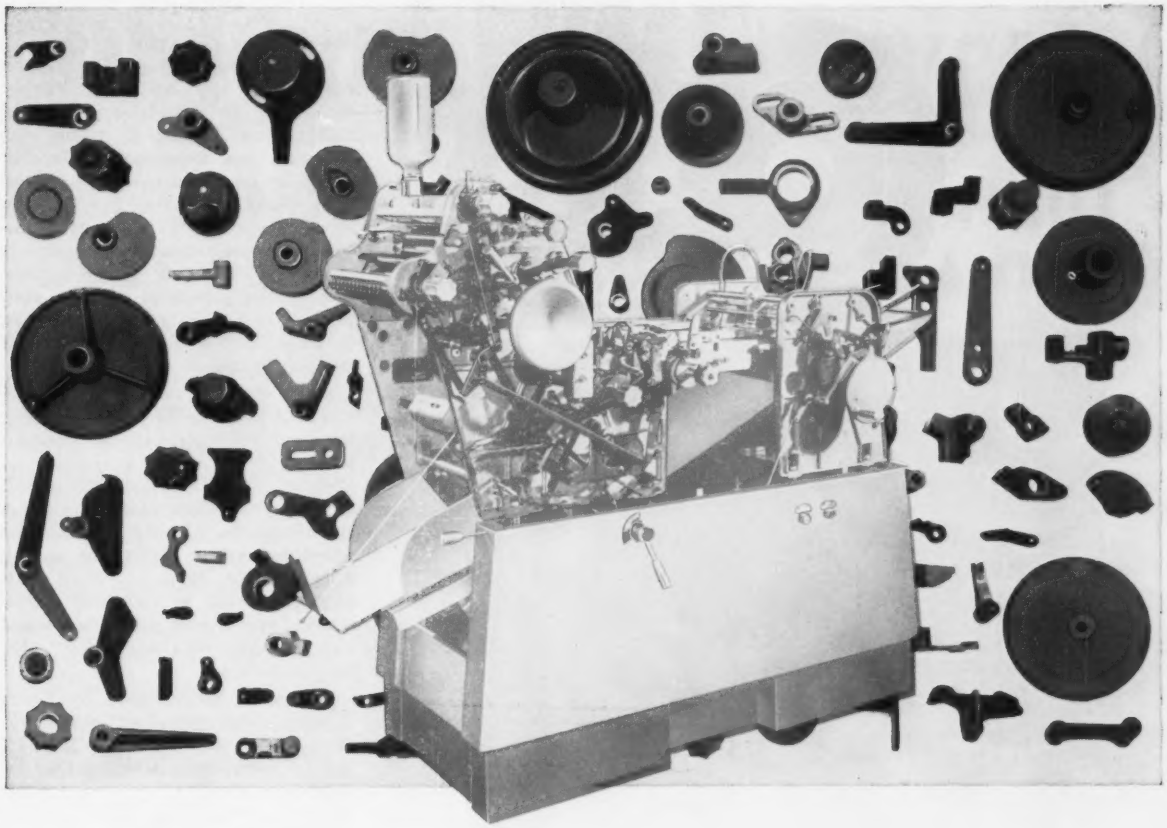
Experience indicates that transfer of aluminum from furnace to ladle and from ladle to mold is the principal source of defects in the castings. In the case of copper-base alloys it is the manner in which the alloy enters the mold cavity which causes the largest number of rejects. Aluminum alloys must be poured without turbulence to reduce trapping of air or creation of metal oxides which, due to the slight difference in specific gravity, do not separate easily from the metal. Holding lip of furnace close to the ladle in transfer of metal, and doing the same with the ladle lip and sprue opening in pouring is recommended. Use of rectangular sprues minimizes inspiration of air by eliminating vortex action.

Discusses Gating and Risering

Gating systems for copper-base alloys should distribute the metal into the cavity quickly and quietly. They require proper sprue design, use of chokes in sprue and runners as well as runner and ingate designs which streamline the metal flow. Risering is another potential source of trouble. Lack of sufficient ingates results in flow of molten metal over a small area and heating it to a high temperature. That condition may cause shrinks near the gate, washing of sand, and considerable turbulence.

Harry E. Gravlin Jr., Claude B. Schneible Co., Detroit, presided at the dinner on Thursday night at which C. L. (Biggie) Munn, athletic director, Michigan State University spoke on "What It Takes." Gist was that in athletics as well as life the willingness to do things that others will not, and the will to win against handicaps make the difference between being average and being great.

Friday morning session was opened by Dean G. G. Brown, University of Michigan, who welcomed some 50 students from the surrounding area, and said it was indicative of the increasing interest in the foundry industry. Fred J. Walls, International



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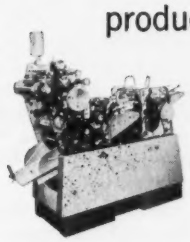

Whitin's *Masterlith* Duplicator* contains over 125 shell-molded parts! And here are the advantages that Whitin gets from selecting shell molding over other foundry techniques:

1. **Smoother finish** that drastically reduces machining, minimizes the need for expensive machining equipment.
2. **Closer tolerances** that enhance *Masterlith* Duplicator performance.
3. **Sounder internal structure** that cuts reject losses.
4. **Precise dimensional reproduction** of intricate shapes.

Whitin uses General Electric shell-molding resins *exclusively* in producing parts for the *Masterlith* Duplicator, relying on them for batch-to-batch uniformity and correctly balanced properties.

*Mfd. by Whitin Business Equipment Corporation, Whitinsville, Mass.

How can shell molding help YOU?

General Electric maintains a shell-molding laboratory in Pittsfield, Mass., to help foundrymen and casting buyers solve problems and evaluate the process. Ask us about it, or write today for a free copy of the *G-E Shell-Molding Manual* which describes and illustrates the techniques and benefits of this new casting method. *CHEMICAL AND METALLURGICAL DIVISION, General Electric Company, Section 6F5F1, Pittsfield, Massachusetts.*

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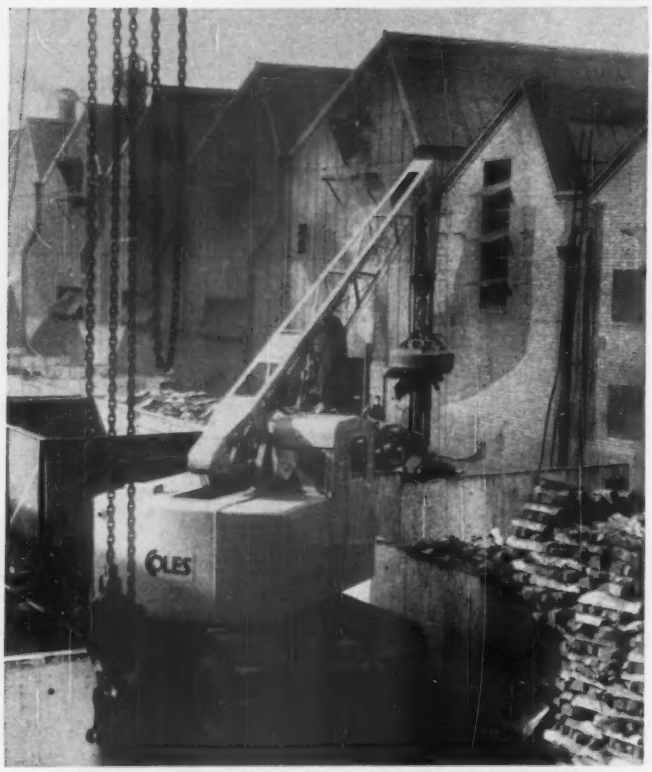

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Nickel Co., Detroit, was technical chairman.

The Foundry Outlook as Science Takes Over by Dean C. J. Freund, University of Detroit, stressed the necessity of keeping in touch with scientific and technological developments to ascertain their possible effects on the industry. The day of employing empirical methods to determine causes and effects gradually is being turned over to the application of the principles of solid state physics, and those in industry should in some degree have knowledge of the possibilities.

Dean Freund recommended that students planning to study engineering or metallurgy should continue their work and obtain a master's degree in modern physics with minors in mathematics and preferably physical chemistry. Also they should learn something about electronics, nuclear science, fluid dynamics, solid state physics as well as advanced mathematical processes and become reasonably familiar with analog and digital computers.

Manpower Maintenance by Harry E. Gravlin Jr., pointed out that unlike the practice with machines this cannot be done on a dollar basis, but in some respects there are parallels. Machines must be adjusted for performance, and so does man. With man the adjustment is providing sufficient information so that he knows exactly what he is to do, and that can be accomplished by proper training. Keeping up a man's interest in his work is important, and much can be accomplished along that line by showing him the over-all application of castings in finished products. Use of incentive factors such as a better job ahead also aid as does improvements in working conditions in the plant.

At the luncheon, with Robert F. Thomson, Research Laboratory, General Motors Co., Detroit, presiding, R. J. Gleffe, Central Foundry Division, General Motors Corp., Saginaw, Mich., presented the Michigan Regional Foundry Conference award of $100 to Roger B. Wood, Michigan State University, for the best student paper relating to the foundry industry. Mr. Wood's paper dealt with the CO_2 process and related some experiences obtained during his past summer's work in a foundry. W. W. Maloney, AFS general manager, gave a brief talk and mentioned the establishment of an AFS Training and Research Institute which will be housed in a new building to be constructed at the society headquarters at Des Plaines, Ill. Two-week refresher courses for foundry personnel in two groups of about 20 each

DUST and FUME topics

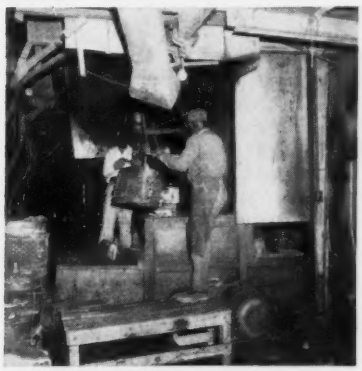
WHEELABRATOR CORPORATION Mishawaka, Indiana

A 4-FOUNDRY REPORT ON SOLVING DUST, FUME PROBLEMS AT A SAVING

Auto Specialties Uses DUSTUBE® to control shakeout tunnel dust

In handling sand from a shakeout, convection of the hot gases tends to make fine particles billow into the air. Auto Specialties Mfg. Co. of St. Joseph, Michigan, controls dust from 3 shakeouts this way:

Hoods are placed in the under-floor sand tunnels for local exhaust ventilation. These pass air at high velocity, gathering dust before it escapes. The ventilating air is ducted to a Wheelabrator Dustube Dust Collector for trapping the dust.



From the 3 shakeouts handling about 90 tons of sand per hour and a facing sand mixer handling about 4 tons per hour, the Wheelabrator Dustube Collector traps 4 cubic yards of dust each two-shift day.

SEND *TODAY* FOR Catalog 372

This condensed catalog contains valuable details on Dustube construction, principles and installations. Ask for Catalog 372.

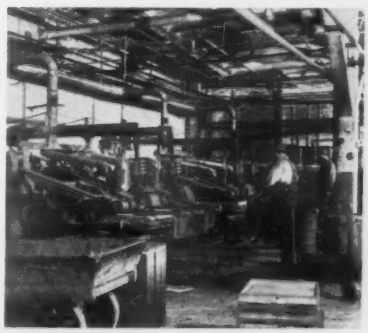
STEEL FOUNDRY TRAPS 300 lbs. of ELECTRIC FURNACE FUME DAILY

A Wheelabrator Dustube Dust Collector installation at Sawbrook Steel Castings Co., Lockland, Ohio, collects about 300 lbs. of dust a day in ventilating two size Q Lectromelt furnaces. This represents more than 99% of the electric furnace exhaust that used to permeate the air in and around the plant. To learn more about this efficient installation, write today for a reprint of story that appeared in a leading publication.

DETROIT MICHIGAN STOVE CO. ELIMINATES METAL DUST with DUSTUBE® Collector

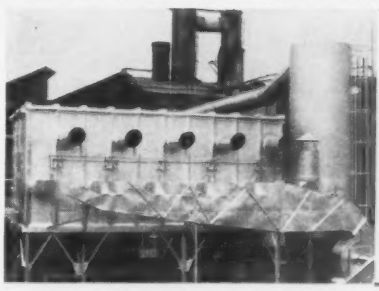
More than 2 tons of fine metallic dust are trapped weekly in a Wheelabrator Dustube Dust Collector at Detroit Michigan Stove Co.

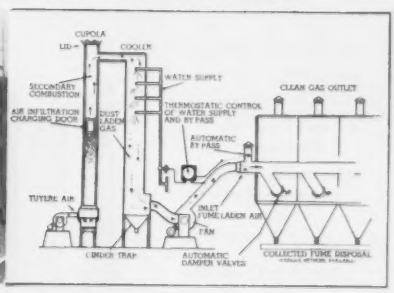
All of the large plate polishers and numerous grinding stands are hooded to keep this dust from getting into the plant air.



The Dustube was selected because of low-cost maintenance and operation, high efficiency and a record of good service from Wheelabrator.

SOLIDS DISCHARGE FROM FOUNDRY CUPOLA ENDED





A certificate of approval without restrictions, from the strict Los Angeles County Air Pollution Board, attests to the efficiency of the Dustube Dust Collector in eliminating discharge of solids from the 54" I.D. gray iron cupola at Lincoln Foundry Corp.

The flow chart of a typical foundry fume control application is shown in the diagram above.

WHEELABRATOR
CORPORATION
505 S. Byrkit Street, Mishawaka, Indiana

Circle 657 on Inquiry Card—Page 203

USING TOO MUCH COKE?

Why not talk this over with one of our metallurgists with a view to taking advantage of the superior quality of Semet-Solvay Foundry Coke in reducing your melting costs.

SEMET-SOLVAY DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 Rector Street — *New York 6, N. Y.*
Buffalo • Cincinnati — Cleveland • Detroit
In Canada: SEMET-SOLVAY COMPANY, LTD., Toronto
Western Agent: WILSON & GEO. MEYER & CO., San Francisco

For Better Melting

Circle 658 on Inquiry Card—Page 203

JOHNSTON
REVERBERATORY FURNACES!

★ Available in full range of sizes. 10,000 lb. furnace shown.
★ All parts exposed to flame or direct radiation are cast iron.
★ Automatic or manual controls.
★ Equipped with Johnston nozzle mixing burners. Also available with oil or combination burners.
★ Lined with top quality refractory brick.
★ Advanced design and quality workmanship throughout.

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- Heating Torches
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- Heat Treating Furnaces
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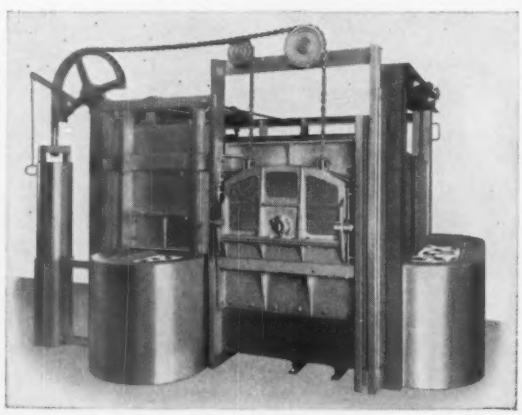

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JOHNSTON MANUFACTURING CO.
2825 EAST HENNEPIN AVE.
MINNEAPOLIS 13, MINN.

ENGINEERS & MANUFACTURERS OF INDUSTRIAL HEATING EQUIPMENT

Circle 659 on Inquiry Card—Page 203

will be conducted, and later technical research will be added to the activities.

Automotive Gas Turbine Development by Don P. Frey, Scientific Laboratory, Ford Motor Co., Dearborn, Mich., described application of castings in the gas turbine as well as of the combination free-piston engine and gas turbine which is receiving attention. In the gas turbine power plant weighing 400 to 550 lb, about 225 lb of castings are employed, many of them being high-alloy materials to withstand the high temperatures involved. Castings include housings, turbine blades, nozzle rings, etc.

Details on the majority of these castings were given in "The Automotive Gas Turbine," in the January, 1956, FOUNDRY.

The newer development, the free-piston engine or gasifier in combination with a radial inflow turbine, weighs about 400 lb of which approximately two-thirds the weight is castings. The unit operates at much lower temperatures than the gas turbine, and lower alloy materials can be employed.

Free-piston engine is about 34 in. long and 16 to 18 in. in diameter. Castings include the shell or housing, heads, compressor bores, pistons, and cylinder liners. Castings in the turbine unit are similar to those in the straight gas turbine except that, due to the relatively low temperatures (900 to 1000° F), lower alloy content materials can be used.

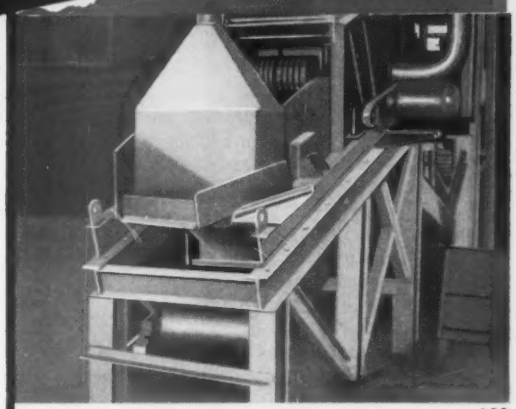
Conveyor Manufacturers Elect Officers and Directors

New president of the Conveyor Equipment Manufacturers Association is J. H. Walker, president, Fairfield Engineering Co., Marion, O. Mr. Walker was elected at the 23rd annual meeting of the group at White Sulphur Springs, W. Va. He succeeds E. E. Boberg, vice president-sales, Standard Conveyor Co., North St. Paul, Minn., who continues to serve, as a director.

Other officers include the following: Vice president, Adrian W. Rich, Fairmont Machinery Co., Fairmont, W. Va.; treasurer, H. E. Murken, Hewitt-Robins Inc., Stamford, Conn., and secretary, J. B. Nordholt Jr., Webster Mfg. Inc., Tiffin, O. Directors are L. J. Johnson, Mathews Conveyer Co., Ellwood City, Pa.; R. Y. MacIntyre, Continental Gin Co., Birmingham, and Frank J. Shude, Anchor Steel & Conveyor Co., Dearborn, Mich.

R. C. Sollenberger continues as executive vice president of the association.

SALVAGE YOUR VALUABLE MOLDING SAND with a SIMPLICITY RING-TYPE CRUSHER SCREEN



188

You profit two ways with Simplicity's Ring-Type Crusher Screens

- Your used core and molding sand is crushed and screened for re-use in one operation, saving the cost of new sand.
- Transportation and dumping costs of used sand are eliminated.

This unit combines the Simplicity heavy-duty vibrating screen with free-turning cast rings mounted over crushing plates. One to three sets of rings can be supplied, depending upon the maximum lump size to be crushed.

Simplicity ring-type crusher screens are paying their way in foundries producing castings of magnesium, steel, malleable and grey iron castings throughout the United States.

Available in many models and sizes. For complete information write today for the name of our sales engineer in your area; and turn your waste into profits.

SALES REPRESENTATIVES IN ALL PARTS OF THE U.S.A.
FOR CANADA: Simplicity Materials Handling Limited, Guelph, Ontario.
FOR EXPORT: Brown and Sites, 50 Church Street, New York 7, N. Y.

Simplicity
TRADE MARK REGISTERED

ENGINEERING COMPANY • DURAND 7, MICHIGAN

Man to Man

RALPH L. LEE

"To consider promotion a reward for mechanical ingenuity or any other accomplishment except qualities of leadership is a mistake"

Promotion Ulcers

WHEN you stop to think of it, it's amazing how well we people in the foundry business seem to get along with so many square, oblong, hexagonal, octagonal and oval pegs in round holes, with only an occasional snug fit.

Although it must be no picnic for a person forced to put in his time on a machine, bench or line at work he was never cut out to do, his unfitness affects only himself and his individual output. But when some poor victim of circumstance, with no talent for it, wakes up to find himself saddled with the headaches of supervising others, then the effect of his unfitness is likely to be multiplied by the number of folks he is responsible for, together with his prospects for a nervous breakdown or ulcers.

The trail left by some of these misfits I have known (including me at times) is not only sad, but bordering on the tragic—strewn with heartbreaks, breakdowns and a dim view of justice and the general scheme of things. But the real tragedy, it seems to me, is that these victims of hasty or uninformed promotions struggle from job to job with the stigma of failure when the real failure was not theirs, but that of those who mispromoted them.

Sink or Swim—On three separate occasions during this rugged and straggling career of mine, I have been pulled out of work I hadn't accustomed myself to and pushed into new assignments with comments something on this order: "Doc, we're probably making a mistake in picking you, but you'll have to admit that we are giving you a chance to make good. You're going to have plenty of rope. See that you don't hang yourself."

I know that well wishes went along with these rather blunt send-offs, yet I since have suspected that my promoters would have preferred higher-caliber talent, but, facing an emergency with no one else handy, chose me in a pinch. I probably was launched on a sink-or-swim basis with fingers crossed and the assurance that if I didn't make good, somebody else would, leaving their skirts clean even though mine would be somewhat bedraggled (career-wise, that is).

All this happened many years ago, and I imagine that this "They are expendable" attitude toward the selection of supervisory personnel is long since out of date. If it isn't, it certainly should be, for according to my experience, an individual without talent no more can succeed as a leader or supervisor of group activities than a musician, artist or actor can.

A Serious Responsibility—As a result of my own personal experience, I don't see how anyone who has had to select people for supervisory positions possibly could fail to appreciate the serious responsibility. A long-time good friend of mine, now retired as a former executive vice president of General Motors, told me many years ago how painstakingly careful the corporation tries to be when moving some one up into a position of much greater responsibility in management.

As I remember, he said something like this: "Ralph, we always are on the lookout for promising management talent. There never seems to be enough. When we hear of someone doing an unusually fine piece of work, we are, of course, very much interested. But realizing the serious harm which can be done to an individual by promoting him to a position which subsequent events prove he was not fitted for, to say nothing of the possible harm to the organization, we check and doublecheck the individual and the conditions surrounding his outstanding piece of work.

"We want to know what part favorable circumstances played in his accomplishment. But, of greater importance, we want to find out what sort of a person he is, what sort of a personality he has and whether he can keep his shirt on, use his head and see through confusing distractions under the stress of emergencies.

"We'll not make a move until we are as sure as we can be, on the basis of our experience, that the candidate for management responsibility has what it takes."

I called my friend on the 'phone to check my memory of what he had told me. "Yes," he said, "you've got the nubbin of it, but be sure to make it clear that we *try* to do what I said. Once in a while, in an emergency, we don't have time to take the care we know we should. Sometimes, you've got to move and move right now, right or wrong."

With the histories of most organizations consisting of one emergency after another—at least it seems that way—there is little wonder that many of our present straw bosses, foremen, superintendents and managers came to their jobs under different circumstances and with qualifications which at a particular time were very important, but for the long haul are shy of the personality essentials for leadership. I don't think there is any doubt that mechanical ingenuity and d e t a i l e d knowledge of operations and equipment frequently were the principal reasons for their promotions.

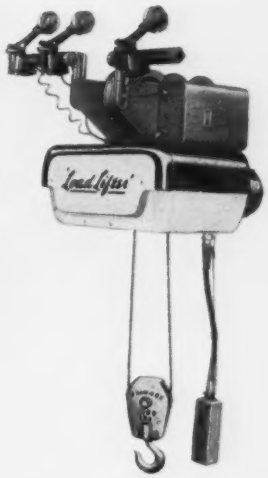
Once in a while we find an individual who is a natural-born mechanic and at the same time an instinctive leader. I think we'll agree, however, that t h i s combination doesn't occur very often—at least

Keep Work Moving ***FAST!***

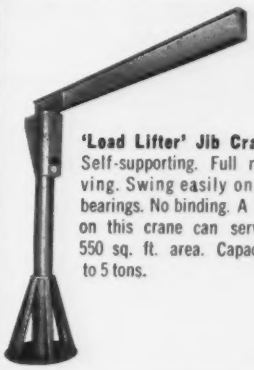
The Series "600" 'Load Lifter' Electric Hoist speeds production — lifts ½-ton loads at 30 FPM at the push of a button. Safe 24-volt push-button control starts this fast hoisting instantly. Two powerful, independently operating brakes are provided for extra safety. Each alone can hold the full load.

The "600" 'Load Lifter' is ruggedly built to meet industry's need for long-term hoisting economy and freedom from costly maintenance. Servicing is easy and safe in the air. No need to take the hoist down. Power and operating costs are low because the "600" mechanism is simple and frictional losses are minimized.

If you want lug or hook suspension, plain trolley or motor-driven trolley — you can have the "600" 'Load Lifter' to fit the need. Also available are current collectors, conductor cord trolleys and other devices to give you efficient, money-saving hoisting equipment from a single source. Capacities ½ and 1 ton. *Ask your "Shaw-Box" Distributor for complete details or write us for Bulletin 408.*



Series "600" 'Load Lifter' Electric Hoist with motor-driven trolley. Trolley available separately for hoists already in service. Installation takes only two hours with common tools.



'Load Lifter' Jib Cranes. Self-supporting. Full revolving. Swing easily on ball bearings. No binding. A hoist on this crane can serve a 550 sq. ft. area. Capacities to 5 tons.

Cord Reels to keep the hoist conductor cord taut and up out of the way of work and worker. Also useful for small cranes and other devices with motors up to 1 HP.

57 F-1

MAXWELL MANNING & MOORE INC. M&M TRADE MARK

'Load Lifter'® ELECTRIC HOISTS

MANNING, MAXWELL & MOORE, INC.

SHAW-BOX CRANE & HOIST DIVISION

386 West Broadway • Muskegon, Michigan

Builders of "SHAW-BOX" and 'LOAD LIFTER' Cranes, 'BUDGIT' and 'LOAD LIFTER' Hoists and other lifting specialties. Other Divisions produce 'ASHCROFT' Gauges, 'HANCOCK' Valves, 'CONSOLIDATED' Safety and Relief Valves, 'AMERICAN' and 'AMERICAN-MICROSEN' Industrial Instruments, and Aircraft Products.

In Canada: Manning, Maxwell & Moore of Canada, Ltd., Avenue Road, Galt, Ontario.

STEARNS
SUSPENDED MAGNET
Purifies Sand, Reclaims Iron

A Stearns rectangular suspended magnet gives you positive and efficient removal of tramp iron — even from heavily loaded conveyors. Magnetic separation cuts costs two important ways:

1. Purifies shake-out and moulding sand

Deep, powerful magnetic field blankets the entire width and depth of the conveyor burden. The large area of magnetic force works out trapped magnetics, eliminates carry-over. You get a clean, pure sand product, ready for further use without risk of contamination.

2. Recovers valuable iron and foundry hardware

Iron fittings and scrap mixed with foundry sand are collected as the material flows through the magnetic field. Sprues, fins, chaplets, gaggers, bars, etc., can be reclaimed or re-melted for new castings.

Greater Flexibility

A Stearns suspended magnet overcomes space limitations because it can be placed over the head pulley or anywhere along the belt. Often it is placed to remove tramp iron before sand moves onto the conveyor, thus guarding belts against damage.

Standard or Special Design

Magnetic specialists at Stearns design and build rectangular or circular suspended magnets in standard sizes, or to your specifications. Magnets especially designed for handling unusually hot foundry sand can be built to meet any requirements.

Free Bulletin Aids Selection

Send today for new bulletin describing five major types of Stearns suspended separation magnets. Gives you complete specifications and simple method of selecting the proper size and type for your application. ASK FOR BULLETIN 1031-G 16

STEARNS MAGNETIC PRODUCTS

A DIVISION OF THE INDIANA STEEL PRODUCTS COMPANY • VALPARAISO INDIANA

635 SOUTH 28TH STREET • MILWAUKEE 46, WISCONSIN

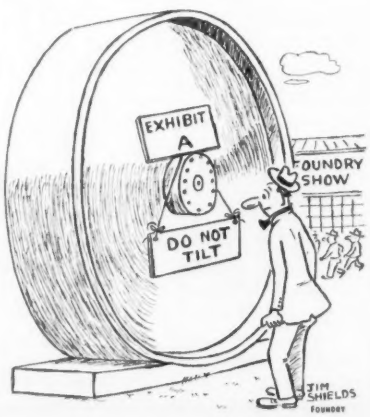
not often enough to supply our ever-present need for supervisory and management talent.

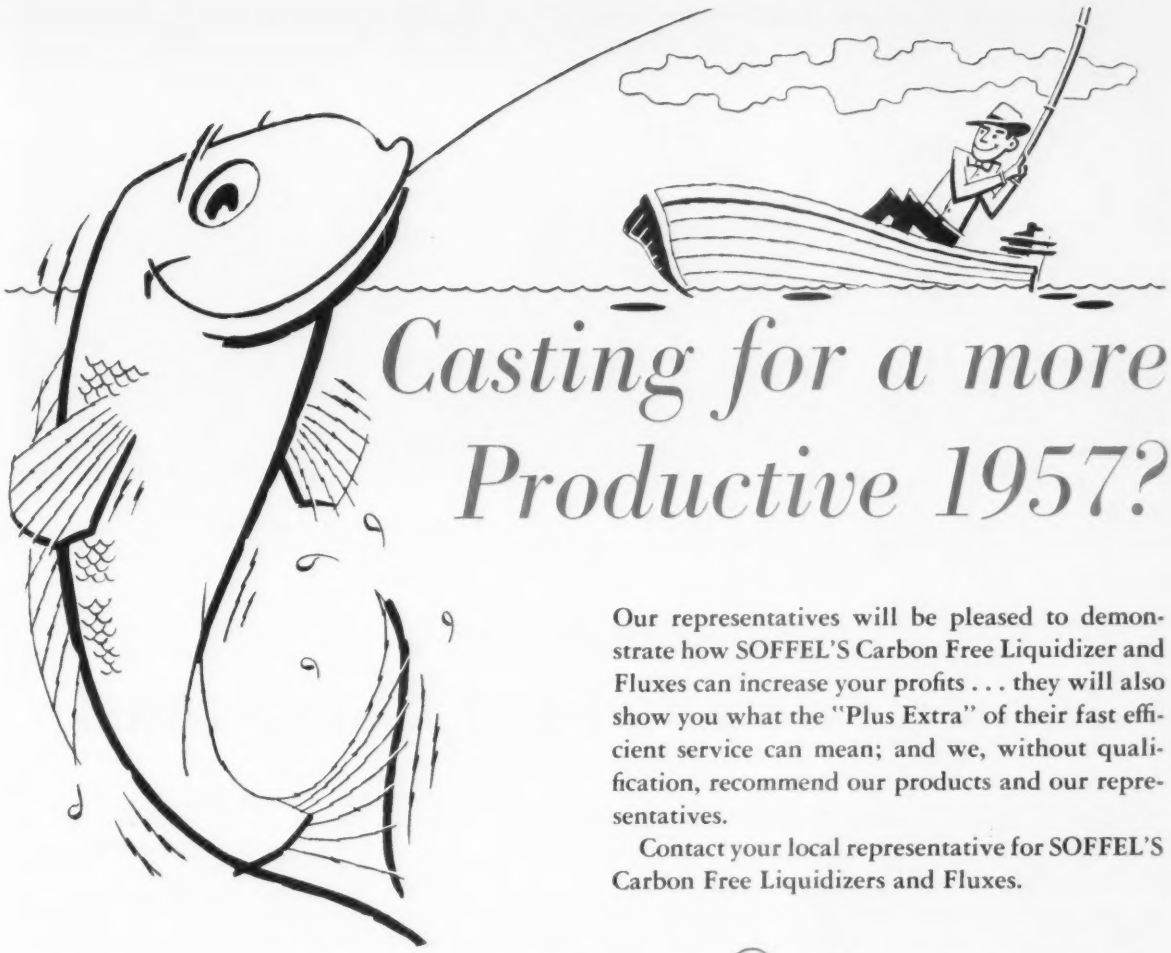
After many years of study of the problems and requirements of effective leadership I am convinced that it's a lot better to supply an individual with a flare for working through others with the mechanical or operational data he lacks than to supply a natural-born mechanic with the leadership techniques he's got to have to direct the efforts of a group.

Eliminating the Misfits—I don't think there can be any question that we always will have square pegs in round holes among our foundry bosses and executives. But it seems to me that once we recognize that there are some individuals who never will get the hang of working through others, no matter how hard they try, how many classes they attend or how much they read to try to learn, we will be able to lessen the number of misfits.

Of one thing I'm sure—to consider promotion up the management ladder a reward for mechanical ingenuity, faithfulness, seniority, knowledge of the business or any other accomplishment than demonstrated qualities essential to leadership is a serious mistake. It may take time to prove this truth, but in my opinion it eventually will reveal itself, leaving in its wake damage to both the business and, particularly, to the unfortunate misfit.

All power to management educational activities, foremen's clubs, management clubs, extension schooling, etc. But at the same time let us develop more effective methods of selecting the individuals who have what it takes to stand up under the punishment of emergencies and other persons' problems and idiosyncrasies and at the same time to attract an enthusiastic following.





Casting for a more Productive 1957?

Our representatives will be pleased to demonstrate how SOFFEL'S Carbon Free Liquidizer and Fluxes can increase your profits . . . they will also show you what the "Plus Extra" of their fast efficient service can mean; and we, without qualification, recommend our products and our representatives.

Contact your local representative for SOFFEL'S Carbon Free Liquidizers and Fluxes.

Phone or Write Your Nearest PMP CO. Distributor:

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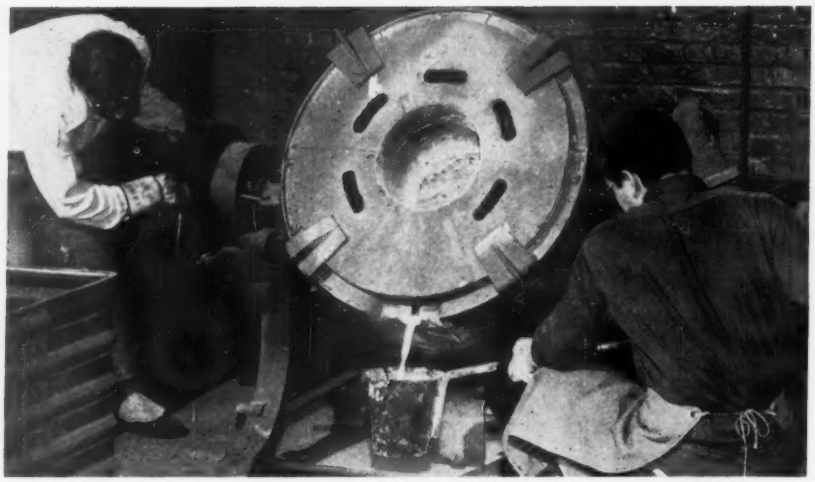
"WORLD'S LARGEST MANUFACTURER OF FLUXES, PURIFIERS AND EXOTHERMIC COMPOUNDS FOR ALL METALS AND ALLOYS"

Casting and a metal strip are components of pin-up lamp base



Two of the boys pour a heat of aluminum from a gas-fired furnace in the Crane Co. experimental foundry. Note protective equipment that they wear

Foundry Group Ranks High Among

Junior Achievement Companies

EVERY year the number of small businesses in this country is enlarged for about ten months by several thousand companies which voluntarily go out of business, regardless of how successful they have been, by May of the following year.

These companies are Junior Achievement groups formed by teenagers who want direct, personal experience in the operation of a business. Currently, some 47,000 teenagers are operating about 3000 Junior Achievement companies.

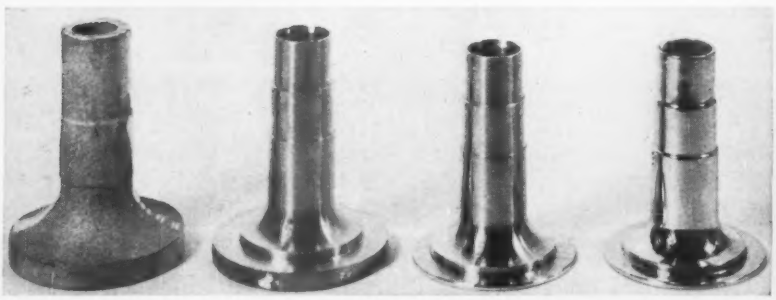
One of these 3000 companies is a foundry operation. Called the Metallic Knights Foundry Co., it is in Chicago and is counseled by the Crane Co., which also sponsors three other JA groups. As mentioned earlier, the teenager companies are formed for one (school) year only, but this is the fourth year in which Crane Co. has sponsored a foundry group.

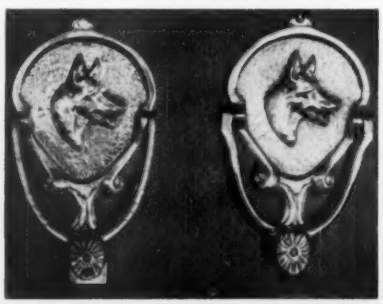
Perhaps strangely, many other foundries participate in the Junior Achievement program, but none supports a foundry-type operation.

Schools Co - operate — Junior Achievement members are recruited through the co-operation of school authorities, and most groups include from 15 to 20 boys and girls. Each

Left—Molds for aluminum garden trowels are made from matchplate

Below—Left, four steps in the production of combination bud vases or candle holders. Right, before and after views of brass door knocker





Stock Core Machine Pays for Self Again and Again and Again!

Simple to operate—apprentice makes cores faster with new, improved "Rapid" Core Extruder—does work of four or five skilled core makers making cores by hand and using dryers.

Here is a practical and economical unit for making perfect stock cores—the "RAPID" CORE MACHINE. Properly mixed core sand falls into the throat of the machine and is forced through a brass tube by a screw conveyor. Formed core is automatically vented. Hand operated or motor-driven, it saves time and money.

Note these features:

1 Set screw controls adjustable force feed rod and mixer for uniform feeding for all size cores.

2 Specially formed hopper lip makes possible the use of an auxiliary hopper when needed.

3 New, specially shaped hopper with adjustable feed rod prevents sand from collecting in pockets; runs clean.

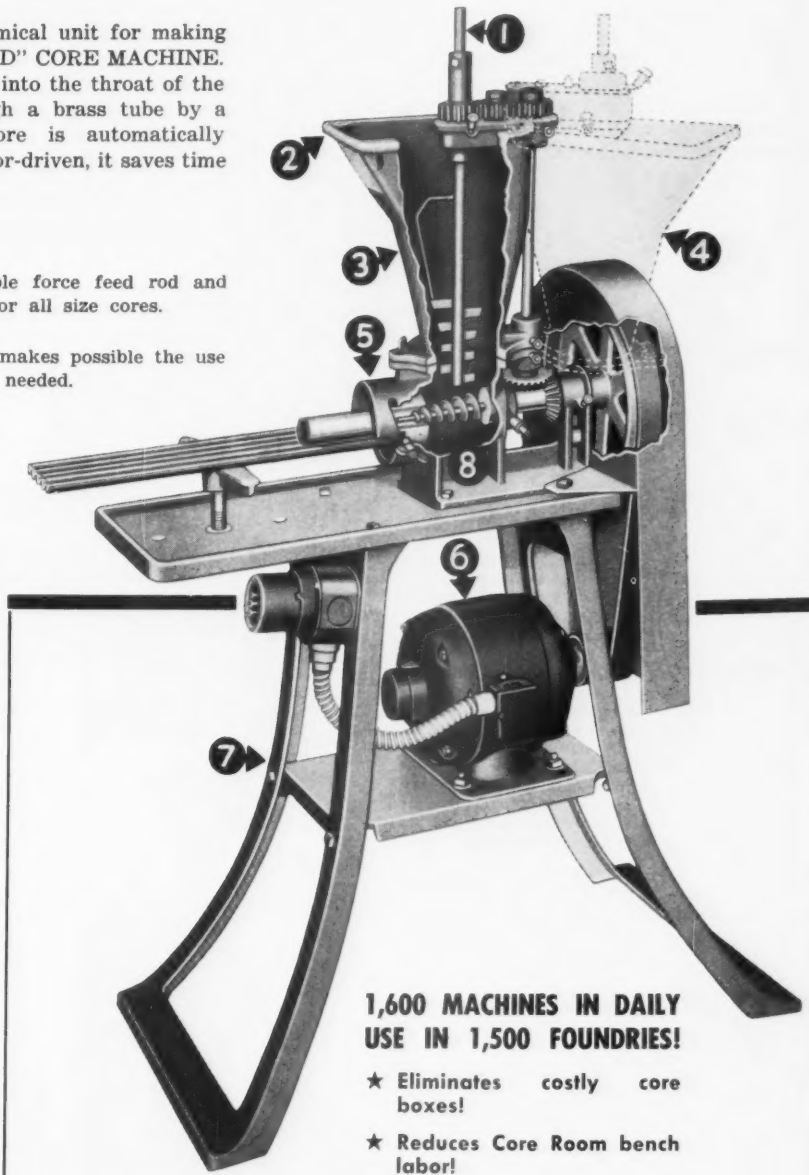
4 Swinging hopper permits ready access to working parts; facilitates cleaning.

5 The tubular die holder, by easy adjustment of tube length permits correct core density for all size cores. Saves time.

6 Adaptable. May be motor driven direct, belt driven or hand operated.

7 Sturdy cast stand with adjustable core tray rest. When machine is furnished without stand, core try holder is secured to machine base.

8 Straight tapered double twist conveyor is self-seating and self-centering, minimizing tube and conveyor wear, and assuring accurately formed cores.



1,600 MACHINES IN DAILY USE IN 1,500 FOUNDRIES!

- ★ Eliminates costly core boxes!
- ★ Reduces Core Room bench labor!
- ★ Does away with core parting line!
- ★ Allows for shrinkage — saves metal and machine work!
- ★ Can produce special shapes in wide range of sizes!

Your inquiry is invited . . . a helpful reply is assured

WADSWORTH
EQUIPMENT CO., AKRON, O.

Stock Core Machines • Coning Machines • Custom Formed Soft Steel Square Twisted Gaggers

company is led, particularly in its first few months, by three or more advisers from local business. These advisers are employees of a "counseling company" and provide only guidance and advice. The company itself is run and administered by the young people.

Capital is raised through the sale of stock, at 50 cents per share. No person can own more than five shares, and each member of the company must own at least one. Average capitalization is about $100. This money is used to provide small tools and raw materials. Rent usually is a nominal charge of about $3 per month.

The original JA foundry company at Crane Co. was called the Blue Devils. At first it used factory foundry facilities, but later was moved to the Crane experimental foundry quarters. The latter offers perhaps $100,000 worth of complete foundry facilities in a reduced area.

Award Winners—The Blue Devils won the first-place Junior Achievement National Industry Award two years in a row. They were succeeded by the Busy Bee Foundry Co., which also won the National Industry Award and a special award as the top Junior Achievement company in Chicago. The four Crane Co. groups won 25 per cent of all awards won by Chicago JA companies.

The teenagers operate foundry facilities under the careful but casual supervision of three production advisers, Larry Sadzewick, Mike Perrino and Charley Jonas. Financial and sales advisers are, respectively, Howie Anderson and Gene Szymanski. Tony Bonadonna is counselor to the foundry company as well as to the other three Crane-sponsored groups. All these men are Crane Co. employees.

Safety Is Stressed — While they work in the foundry, the teenagers wear such protective equipment as their work requires. Once each program year the Crane safety superintendent holds a meeting for all JA companies to explain good safety practices. The young foundrymen have not had a major accident in the four years the foundry companies have operated.

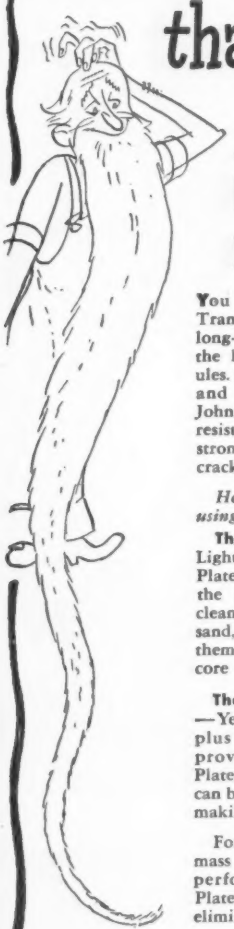
Molding operations are performed with patterns purchased from the Crane Co. The members make green sand molds, melt and pour the metal, shake out castings, do sandblasting and finishing. Two furnaces, one electric and the other gas-fired, are used for melting.

To date, the company has had no sales problems. It sells its entire output, and the quality of workmanship and novelty of the products makes its merchandise sought after. The average JA group grosses about $300 during its approximately 10-month period of operation, but one report for the foundry company over a like period showed gross sales in excess of $2000.

What They Make—Its products include brass and iron trivets at $1.20 each; bud vases and/or candle holders at $2.40 a pair; brass door knockers at $2.45 each; cast aluminum garden trowels at $1.75 each; and cast iron lamps which are sold as-cast on a subcontract basis.

Morale of members is reported to be so high that most of the group shows up an hour before the scheduled time. Officers of the company are Bob Venkus, president; Tom Zukowski, secretary; and Gil Orejudos, treasurer. Other members are George Dodley, Ed Gribac, Chuck Heppner, Don Johnson, Tom Linane, Bob Raunich, Bob Riebau, Bob Smitko and Dwain Tollison. They attend Kelly, Lindblom, Tilden Technical and St. Ignatius High Schools.

Looking for core plates that LAST LONGER?



. . . then use TRANSITE CORE PLATES that stay on the job year in, year out

You can rely on durable Transite* Core Plates to give long-term service, even under the heaviest foundry schedules. Made of fibrous asbestos and cement, by a special Johns-Manville process, they resist shock and corrosion, are strong and durable, will not crack or break easily.

Here are more reasons for using Transite Core Plates:

They speed production—Light-weight Transite Core Plates are easier to handle on the job. They're easier to clean, too . . . core wash, sand, etc., do not adhere to them as readily as to other core plate materials.

They maintain accuracy—Years of foundry service, plus exhaustive tests, have proven that Transite Core Plates do not warp readily . . . can be used for precision core making indefinitely.

For core plates of large mass and small surface area, perforated Transite Core Plates are also available to eliminate green cores and reduce baking time. For full details, write Johns-Manville, Box 14, New York 16, N.Y.

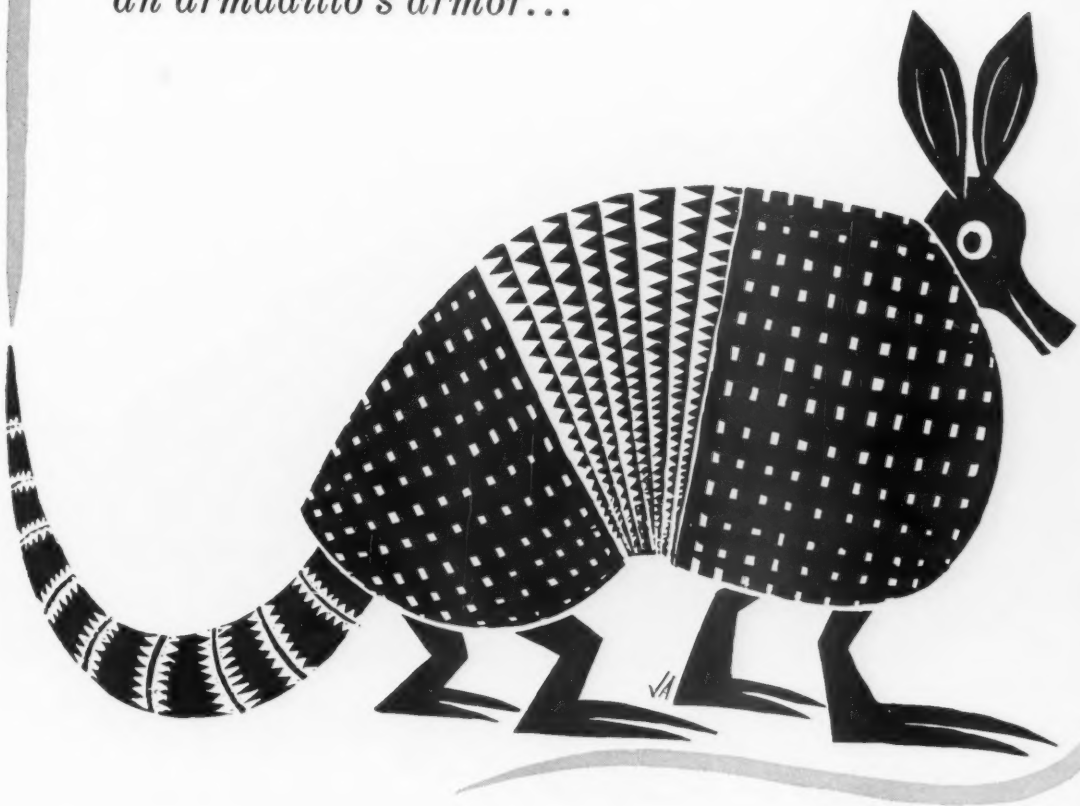
JM PRODUCTS

*Reg. U. S. Pat. Off.

Johns-Manville TRANSITE CORE PLATES

Made of Asbestos

You may never cast an armadillo's armor...



but for definition, uniformity, savings...investigate

Plenco shell molding resins

PLENCO PHENOLICS

FOR BETTER PLASTIC PRODUCTS

PLASTICS ENGINEERING COMPANY

Sheboygan, Wisconsin

Significant examples are available which demonstrate the effective use made of the shell molding process by foundries. They verify definite improvement of product quality coupled with substantial savings in time, labor, and materials. Greatly reduced machining costs alone (in some cases eliminated entirely) through the application of Plenco shell molding resins make it well worth your while to consult with us.

Serving the plastics industry in the manufacture of high grade phenolic molding compounds, industrial resins and coating resins.

Around the Country

NEWS REPORTS FROM

Philadelphia . . . Chicago . . . New York . . . Pittsburgh . . . Detroit

Chicago— Current shipments of foundry coke are considered to be a better index of gray iron and malleable casting production than are shipments of pig iron. Reason is that the exceedingly high prices of cast iron and steel scrap are prompting foundries to use more than normal proportions of pig iron in cupola melts.

For some time, pig iron sellers have been observing that their orders seem to be increasing at a rate which exceeds rather than parallels castings output. There is no need to build inventories of pig iron at present—supply is adequate to meet needs fully and no price increase impends. Plain economics are at work. The melter is simply using less scrap and more iron in each ton of castings to keep costs down.

Coke is bulky and no foundryman cares to carry more than a normal working inventory. Furthermore, fuel is under no price pressure, it is in easy supply and available for prompt shipment. Consequently, its consumption constitutes a more reliable yardstick of foundry activity than does pig iron.

* * *

At the 12th annual National Noise Abatement Symposium in Chicago in October, Robert A. Ewens, executive director, Wisconsin Manufacturers Association, advocated pre-employment hearing tests as a means to help fix employer responsibility in states having hearing loss compensation laws.

"A pre-employment audiometer examination is at least a starting point," he stated. "A person may be 20 per cent defective in hearing when he is hired and ten years later, due to either noisy environment or some other cause, may be 25 per cent defective. His employer will know at least that he is not responsible for the first 20 per cent."

Allis - Chalmers Mfg. Co., Mr. Ewens reported, long has made prehiring tests and finds that one-quarter of job applicants have some hearing defects.

The problem finally resolves itself to a question of legislative action, Mr. Ewens said, and he urged conference attenders to discuss their industrial noise problems with their state legislators. He warned that unions are certain to foster legislation on the subject.

Detroit— As automobile makers slowly back out of the high horsepower limelight, they gradually edge up the scale of power-to-weight ratio. The desire is to achieve greater efficiency, increased maneuverability and improved agility in motor cars. Most of the horsepower increase in recent years has gone into that effort. Higher road speeds are not a goal. Top speeds have been increased only about 10 per cent since World War II.

Although the power ceiling has not been reached, growing resistance to higher horsepower is developing among customers, who see no need to feed so many horses, and among government officials who harbor the idea that high horsepower is unsafe.

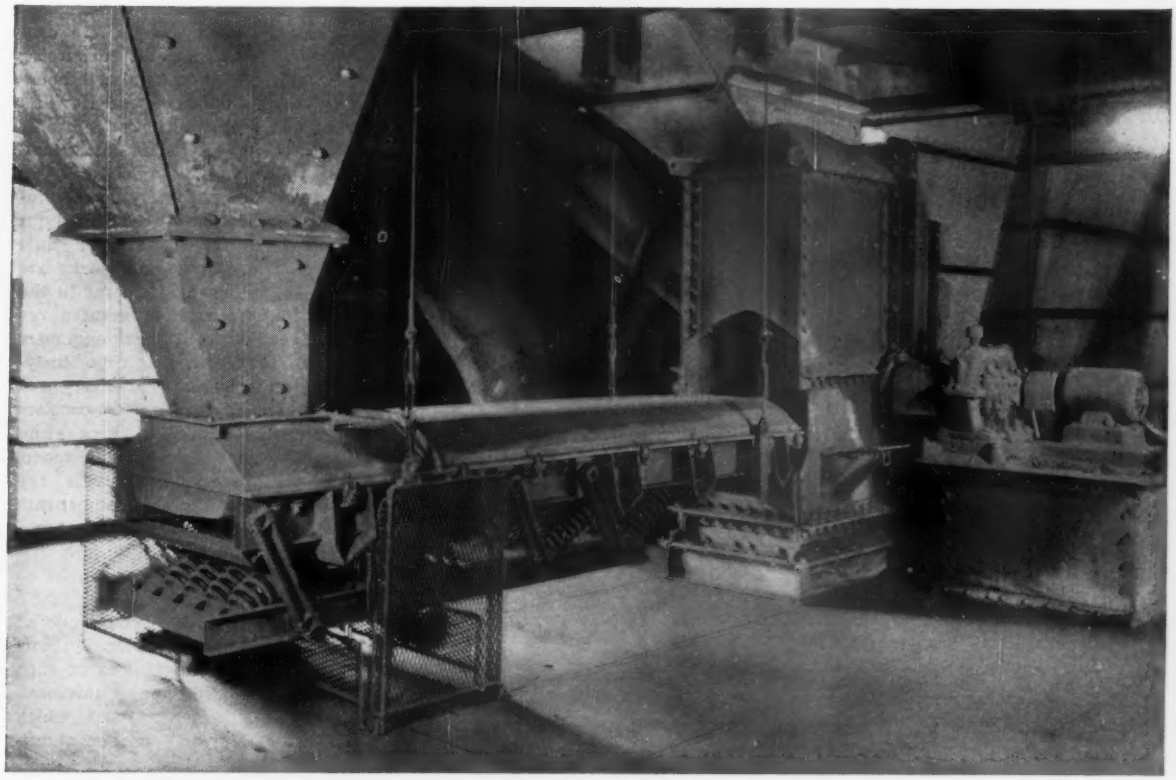
The answer, then, to improved operational standards is reduced weight while leveling off on power. Since consumers do not want a smaller car, weight must be taken out of current size models. And that is the direction manufacturers are moving. So far the biggest move primarily has been to use aluminum in place of heavier metals.

The average 1956 auto had about 30 lb of aluminum castings and 4 lb of wrought products. The 1957's carry 33 lb and 12 lb, respectively. By 1960, experts estimate the average car will use 150 lb of aluminum. Current models in all Chrysler Corp. divisions average 85 lb.

Most aluminum automotive castings are cast in dies or permanent molds, although a few are made in sand. Practically all have replaced parts previously made in other materials, by casting, forging, stamping or machining. Exceptions, however, are found in components of the newer accessories such as power brakes and steering and in automatic transmissions. Many parts in

Left—Three Robert E. Kennedy scholarships were presented at Nov. 5 meeting of Chicago Chapter of the AFS. Left to right are Prof. Roy W. Schroeder, Navy Pier Branch, University of Illinois; Dean Fred W. Tresize, Navy Pier Branch; Joseph J. Castronovo and Arnold Alek, scholarship winners; John Rassenfoss, American Steel Foundries; Fred C. Bahr, also a scholarship winner; and Robert P. Schauss, Werner G. Smith Inc. *Right*—At that same meeting, three foundry scholarships sponsored by Kensington Steel Co. were presented by Prof. Schroeder, left. Winners T. Andretich and Roy G. Hlavecek were on hand. Algert Stanevich was not present. All winners are University of Illinois students, four at Navy Pier

CARRIER *does the "IMPOSSIBLE" for the biggest names in industry!*



60 Tons-Per-Hour of Red Hot Ore Handled by a Cool 2 HP!

WHEN a large eastern steel company ordered this heavy duty Carrier Feeder, trouble-free performance was their chief requirement, since it was to be installed in a key position in their sintering plant. It had to handle up to 60 tons per hour of 1800° F. materials, with virtually *no* maintenance—a task which it has taken in stride!

There's a *reason* why Carrier Natural-Frequency Feeders need less maintenance. Unlike magnetic or any other kind of "brute-force" vibrating equipment, Carrier Feeders utilize the enormous forces of *Natural-Frequency spring action.* In the 2 HP feeder shown above, the coil springs are excited by a 15-lb. weight—*and actually generate an alternating force of 3½ tons!*

This large force is distributed evenly along the whole length of the feeder. Internal stresses are very low and are not concentrated at any one point. Bearing loads are low since the drive shaft supports only the small exciting weight —neither the feeder nor conveyed load weights are supported by the bearings at any time.

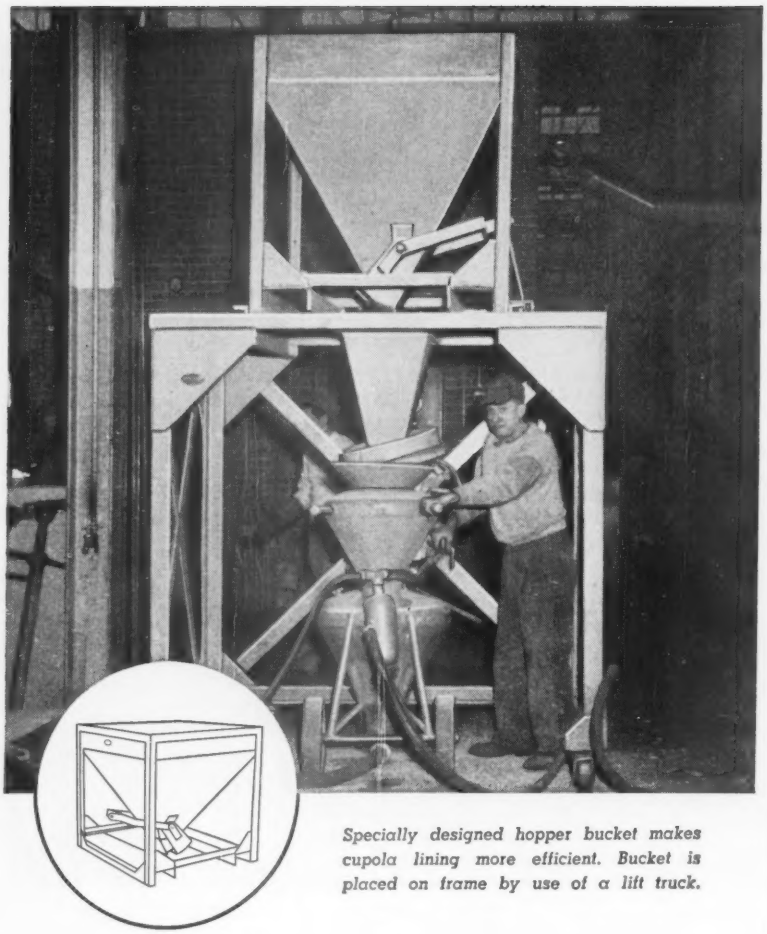
Average conveyed material temperature is 1800° F. Changes in temperature do not warp or distort the Carrier Feeder. A special high temperature design makes it possible for the overlapping feeder trough sections to expand and contract as required—without any build-up of internal thermal stresses. Except for the drive motor, Carrier Feeders are completely mechanical, making maintenance a simple matter. Trough sections are easy to remove and can be replaced at any time with a spare from your own shop.

Design features such as these result in a feeder capable of continuous, trouble-free, economical operation in the most rugged of installations.

Carrier Natural-Frequency Feeders can reduce your maintenance and operating costs. Let us send you complete information.

CARRIER
NATURAL-FREQUENCY
CONVEYORS

Carrier Conveyor Corporation
239 North Jackson Street, Louisville 2, Kentucky



Specially designed hopper bucket makes cupola lining more efficient. Bucket is placed on frame by use of a lift truck.

Solve Your Material Handling Problems With **PENN IRON SPECIAL EQUIPMENT**

In lining cupolas, Textile Machine Works foundry in Reading, Pennsylvania, had difficulty handling the clay mix used with their Bondactor equipment. After a study of the problem, Penn Iron Works, Inc., designed, engineered and manufactured this special hopper bucket for maximum handling efficiency.

Whatever the bulk-material handling problem in your plant, Penn Iron Works, Inc., will be glad to help with its solution. Our wide experience in designing and manufacturing all types of buckets and special handling equipment for foundries can help you cut costs . . . save time . . . increase efficiency.

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION MEMBER FEMA

PENN IRON WORKS, INC.
READING, PENNSYLVANIA

these units were designed originally for production in aluminum.

Additional aluminum cast parts included in some models of today's cars are die cast bumper wings, permanent molded complete bumpers, permanent molded pistons, die cast decorative items, die cast carburetor bodies, die cast housings and housing extensions, die cast generator and starter end bells and cylinder heads, intake manifolds, rocker arm supports and bearings.

Engineers see the early use of aluminum for die cast wheels, tail light assembly housings and rear axle housings. Die cast engine blocks are a little farther away. And far in the future, if the trend to greater use of glass areas continues, engineers may go to a carcass type body-frame design similar to that used on the French "Gregoire." It consists of an upright bulkhead, separating passenger space from engine space, which will be integral with the frame. Tops and other components can be cantilevered from the bulkhead without intermediate supports. Such a bulkhead probably would be cast.

Also, some use has been made of air or hydraulic suspension systems to obtain a softer ride. Use of such systems might become universal. They require cylinder units which probably will involve use of aluminum castings. Another possible castings application might be for use with doors that extend into the automobile roof. Several so-called dream cars have made use of this feature.

Pittsburgh— Foundry activity dropped during December from its high fourth quarter level. Producers of castings and sellers of foundry equipment attributed the decline to customers' inclinations to hold inventories as low as possible by year-end. With no danger of a shortage of castings, this year followed the customary peacetime tradition of a slowdown during the holiday season.

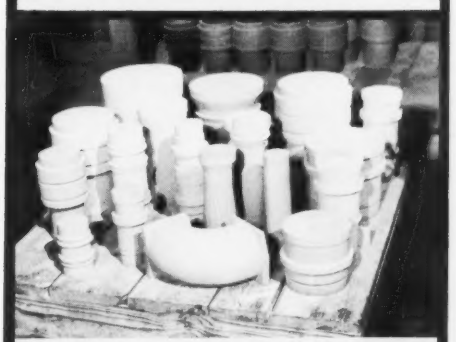
Despite the slowdown in sales, foundrymen and their equipment suppliers are optimistic about the outlook for 1957. A major producer of machinery reports it has an excellent backlog from the early fourth quarter, and inquiries are strong. As yet, the heavy rate of inquiries is not being translated into actual sales. Customers are reluctant to place orders before knowing how strong business will be in 1957.

Sales of castings to mill equipment producers lagged in December, despite heavy steel production rates. With steelmaking expected to remain at capacity in the first quarter, this

Circle 668 on Inquiry Card—Page 203
Circle 669 on Inquiry Card→

A BATCH OF 4% RESIN-COATED SAND EVERY 6 MINUTES

for shell molds



for shell cores

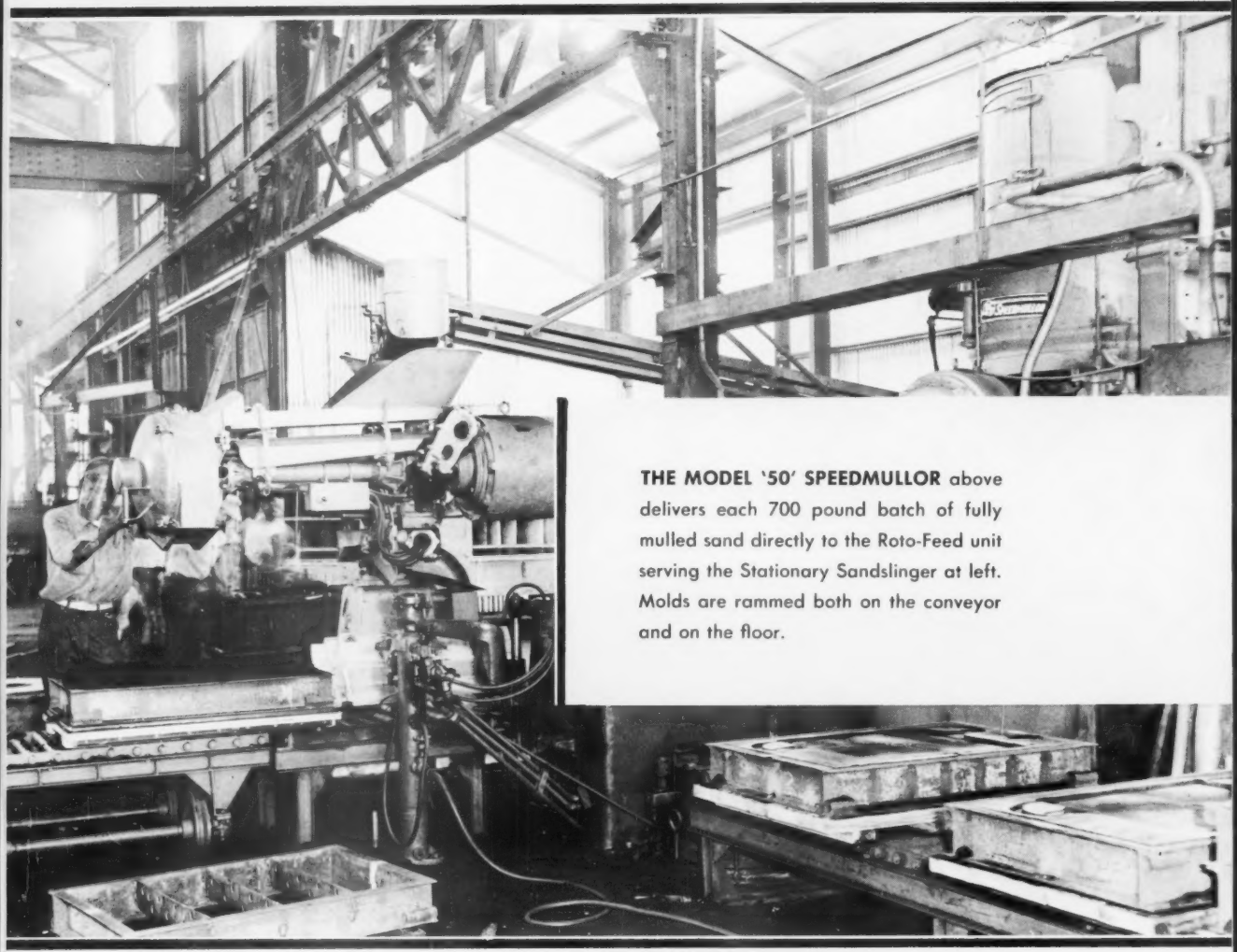
AT RACE AND RACE, Winter Haven, Florida, the same CP30 Shell Speedmullor resin-coated mix is used for both molds and cores. Speedmullor coating is so efficient that resin segregation is completely eliminated, even in shell coreblowing. Total cycle time for complete coating is five to six minutes, and maximum molding and coreblowing shell sand properties are obtained with 4% resin content. The efficient CP30 can prepare all of the shell sand required in a few hours a day.

At present, Race & Race, outstanding producer of aluminum pipe, employs twelve men in their shell operations. They've shown that even the small shell molders can successfully and efficiently utilize the most advanced shell sand preparation equipment . . . the Shell Sand Speedmullors. Send today for full information, write to Beardsley & Piper, Div. Pettibone Mulliken Corp., 2424 N. Cicero Ave., Chicago 39, Ill.

THE WORLD'S LARGEST EXCLUSIVE MANUFACTURER OF FOUNDRY MACHINERY

same floor area
same manpower

YET, THIS SMALL FOUNDRY HAS BOOSTED OUTPUT A FULL 50%



THE MODEL '50' SPEEDMULLOR above delivers each 700 pound batch of fully mulled sand directly to the Roto-Feed unit serving the Stationary Sandslinger at left. Molds are rammed both on the conveyor and on the floor.

A "50A" SPEEDMULLOR AND A STATIONARY SAND-SLINGER have put the Maddox Foundry of Archer, Florida, on the road to efficient, fully-controlled operation. Operating a small foundry, with only 28 men, including supervision, Maddox produces a wide range of castings for their own products and casting customers. Casting weights vary to 13,000 pounds and a large number of different patterns are used each day.

The new "50A" Speedmullor has given Maddox the control needed and permitted the introduction of synthetic sand practice. A full 700 pound batch is loaded, completely mulled and delivered to the slinger's Roto-Feed Unit in 90 seconds. The Stationary Sandslinger easily handles Maddox' large range of work and rams molds on a roller conveyor and on the floor. Write for complete information!

Beardsley & Piper, Div. Pettibone Mulliken Corporation, 2424 N. Cicero Avenue, Chicago 39, Ill.

THE WORLD'S LARGEST EXCLUSIVE MANUFACTURER OF FOUNDRY MACHINERY

lull should be only temporary, foundrymen believe.

On the brighter side, demand from automakers increased rapidly in late 1956. Several foundries which worked only one shift per day in October and November due to slim demand found it necessary to work two or three shifts daily in December.

Foundrymen are concerned with rising scrap prices. With no chance to cut use of scrap, increasing costs make it more difficult to operate at a satisfactory profit.

Philadelphia—Foundry operators anticipate an early rebound from the year-end holiday lull. Gray iron shops see considerable work ahead in paper-making machinery and material handling equipment, as well as an upswing in general miscellaneous requirements. Steel and malleable shops expect to resume at the active pace that prevailed right up to the holiday. Only in nonferrous is there a prospect of a continued lag.

Gray iron foundries will start off the year with a five-day week. Job shops will be working on backlogs of two to three weeks, while some of the captive and specialty shops will be working on accumulations of possibly four weeks. Interestingly, one of these latter, engaged primarily in material handling requirements, shipped more tonnage in November than at any time since May, 1951.

Demands on the steel foundries are heavy. There is relatively little defense demand, but requirements for gears and housings and miscellaneous engineering parts are considerable. These shops will begin the new year with operations of around five and a half days a week, with backlogs of seven to nine weeks. Malleable shops have backlogs of five to six weeks and most will resume at five days a week; others at five and a half days. Demand for pipe fittings will be well sustained and there will be some pickup in automotive requirements, although they are not too heavy at most in this area. Builders hardware is expected to lag for a while.

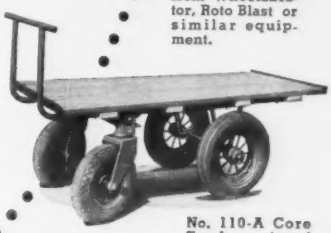
Most nonferrous jobbing foundries will probably continue on a hand-to-mouth basis for the time being. But operators are a bit more optimistic especially as to shipbuilding needs. Maritime work is still spotty, but prospects for a pickup over coming weeks are much more encouraging. Meanwhile, plumbing supply requirements are slow and there is little overflow from captive shops. Most brass and bronze jobbing foundries will be operating in January with less than two weeks' backlog. Light metal business also is spotty.

TRUCKS for Foundries!

Sterling Heavy Duty Trucks are tailor-made for transporting castings, cores and heavy foundry equipment. Ruggedly constructed for heavy duty service and thoroughly job-tested under actual foundry conditions, Sterling Trucks have proven their ability to handle loads as heavy as 3 tons. Both wheels and casters are equipped with anti-friction bearings. Short turning radius. Easy maneuverability. Write for bulletins.

STERLING WHEELBARROW CO.
MILWAUKEE 14, WIS., U. S. A.

No. 160 Truck to receive castings from Wheelabrator, Roto Blast or similar equipment.



No. 110-A Core Truck equipped with pneumatic-tired wheels and ball bearing swivel casters.

No. 50 Slag Buggy especially designed for conveying slag. Heavy duty, reversible tray. Loose plate for discharge.

Sterling
FOUNDRY EQUIPMENT

A 5633-½R

Circle 717 on Inquiry Card—Page 203

PRODUCTION PATTERN EQUIPMENT

machined all over and engineered to fit the needs of your foundry

Write or phone for further information

Anderson Pattern Inc.
MUSKEGON MICHIGAN

Circle 718 on Inquiry Card—Page 203

Members of the T & O Committee of SFSA who were present at the 11th annual T & O Conference of the society included the following: Front row, A. M. Herrmann, C. W. Briggs, I. M. Emery, R. A. Gezelius and Howard E. Gebhardt. Rear, R. O. Tibbals, C. B. Williams, E. B. Nutter, Arthur P. Guidi, David Wheeler and W. J. Stewart

Record Attendance Marks

STEEL FOUNDERS T & O CONFERENCE

I. M. Emery, Massillon Steel Casting Co., Massillon, O., is the national T & O chairman of the society

THE 11th annual Technical & Operating Conference of the Steel Founders' Society of America, held Nov. 7-9 at the Hotel Carter, Cleveland, set a new attendance record of 636.

Representatives from all steel foundry centers of the nation were in attendance. Government representatives from the Department of Defense representing research, ordnance, motor vehicles, aircraft and ships attended as guests of the society.

Attendance also included sales personnel from member companies representing product and market development activities within the society. The T & O Committee arranged one afternoon and one morning session of its program so as to be of mutual interest to the operating, engineering and research personnel representing their activities and the market side of steel foundry management.

The first morning session was devoted to the economies of some of the new processes, such as carbon arc metal removal, mechanical blast cleaning, new core blowing equipment, carbon dioxide and cold set binders, shell molding and a review of exothermic materials in the light of present-day costs.

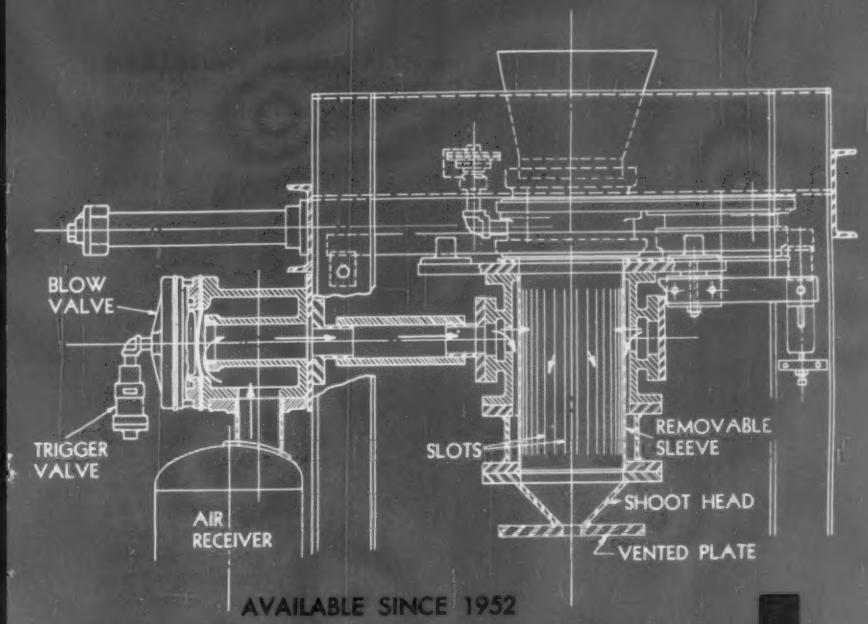
The second session revolved around developments in molding operations and the growing importance of bentonite quality upon the production of steel castings.

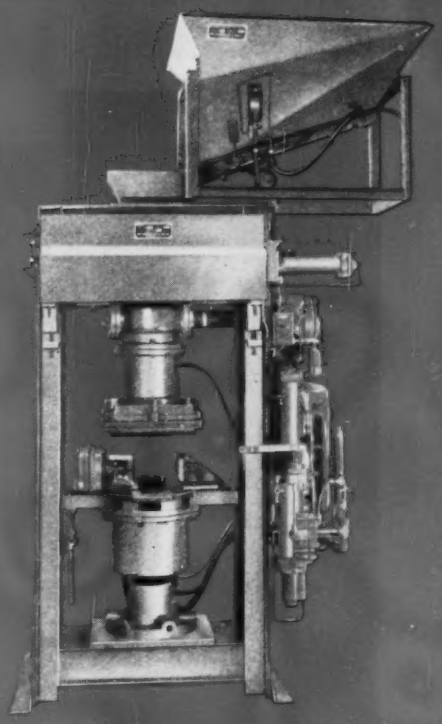
Thursday morning was devoted to various problems posed by companies in the steel castings industry which were presented by a panel, after which an active discussion period took place.

Another session was devoted to steel casting requirements in various fields of service applications including refineries, power, gears, ordnance, magnetic, earth moving and mining and a comparison of nodular iron with steel castings.

"Inspection as Related to Quality" featured the Friday morning discussion. "Trends in Steel Casting Specifications," the practical application of standards to various types of casting service, consideration of 100 per cent inspection for highly stressed installations, quality control and the maintenance of presently established dimensional tolerances were covered.

Howard F. Park Jr., president of





AVAILABLE SINCE 1952

#101-EO DEMMLER CORE BLOWING MACHINE

This machine may be used for shooting cores by substituting a shoot head for the standard blow plate.

Best quality cores are often produced by the time tested blowing method, and when it is preferred to use the machine as a blower the change can be made quickly and conveniently.

These are the same type machines as the successful Demmler mold blowers which have been breaking molding records for the past three years.

Yes, you can have a machine that gives you complete flexibility, to blow or shoot as you choose. Write us for complete data on this Demmler 101-E machine.

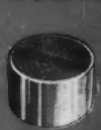
DEMMLER

FIRST NAME IN CORE BLOWERS

ONE MACHINE DOES BOTH ..... BLOWS OR SHOOTS CORES

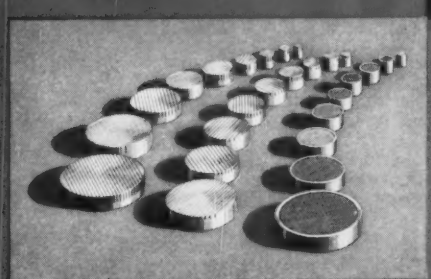
PRECISION CORE BOX VENTS

Demmler is by-far your best source for precision core box vents, manufactured by specialists who pioneered in the core blower industry. Many sizes, slot widths and screen meshes are available in brass and steel core box vents.



NEW HL 150 Mesh Vents

A new general purpose vent which practically eliminates the cleaning coarser screens demand. Write for literature on Demmler vents.



WM. DEMMLER & BROS.

KEWANEE, ILLINOIS

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KOPESEAL®

COPE and DRAG SEALER

FASTER...EASIER...BETTER
than mud or dough rolls!

READY TO USE! *No time-consuming mixing. Handy 30" beads in diameters from 3/16" to 3/4"*

POSITIVE SEATING! *Permits accurate measurement of metal thickness.*

ELIMINATES RUN-OUTS! *Note in photo how close KopeSeal comes to edge of impression.*

SELF-DISSIPATING! *No residue to worry with... use it! seal it! forget it!*

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PRESSTITE Sealing Compounds
PRESSTITE-KEYSTONE ENGINEERING PRODUCTS COMPANY
K A P

A Division of AMERICAN-MARIETTA COMPANY
3766 CHOUTEAU AVENUE, ST. LOUIS 10, MISSOURI

the SFSA and vice president-sales, General Steel Castings Corp., Granite City, Ill., welcomed those attending the conference at the Wednesday noon luncheon.

Harry A. Stuhldreher, U. S. Steel Corp., presented an excellent analysis of "The Safety Position" as both a mental problem as well as one of physical conditions and alertness.

Edward A. McFaul, Chicago, was the featured speaker at the Thursday noon luncheon. His subject was "You Had Better Come Quietly." "The Five Casteels," a barbershop quintet from the Massillon Steel Casting Co., entertained with a selection of old-time ballads.

Plans for the 1957 T & O Conference were discussed at the meeting of the T & O Committee held immediately after the close of the sessions. I. M. Emery, president of the Massillon Steel Casting Co., Massillon, O., is chairman of the committee, which also includes:

David Wheeler, Empire Steel Castings Inc., Reading, Pa.; W. J. Stewart, Dominion Foundries & Steel Ltd., Hamilton, Ont., Canada; Arthur P. Guidi, Texas Foundries Inc., Lufkin, Tex.; Howard E. Gebhart, Blaw-Knox Co., Continental Foundry & Machine Div., Coraopolis, Pa.; C. B. Williams, Massillon Steel Casting Co., Massillon, O.; A. M. Herrmann, Racine Steel Castings Co., Racine, Wis.; R. O. Tibbals, American Steel Foundries, Granite City, Ill.; E. B. Nutter, Alloy Steel & Metals Co., Los Angeles; William M. Halverson, Electric Steel Foundry Co., Portland, Oreg.; R. A. Gezelius, General Steel Castings Corp., Eddystone, Pa.

SFSA staff guidance and arrangements for the conference were under the direction of Charles W. Briggs, technical and research director of the society, in which he was assisted by Robert A. Willey, assistant technical and research director, James A. Moseley, technical assistant, and Erwin Dieckmann, office manager.

"What are you substituting for parting sand?"

TAME

high sulphur scrap with

Shooting for sound, strong, machinable castings from high-sulphur scrap . . . or for faster, cleaner melting? Your best bet on *both* counts is Purite.

Here's what Purite accomplishes in the cupola. Reduces sulphur content as much as 25%. Increases slag fluidity. Speeds combustion reaction and checks bridging.

And in the ladle . . . Purite desulphurizes the metal to exact specifications; assures clean, quiet-pouring metal for quality castings.

You can't beat Purite's convenience, either. The solid, non-crumbling, 2-pound pigs are a natural for simple storing and easy usage.

Ask your foundry supply house why Purite has been a favorite among progressive foundrymen for over 30 years. And for the full story on how Purite goes to work to increase your profits, write—

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OLIN MATHIESON CHEMICAL CORPORATION
INDUSTRIAL CHEMICALS DIVISION · BALTIMORE 3, MD.

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"Our Edco Bottom Boards hold up at high temperatures"

. . . says Robert Garrett, General Foreman, Lebanon Steel Foundry, Lebanon, Pa.

A producer of high quality stainless, special alloy, and carbon steel castings, Lebanon Steel Foundry has been using Edco Dowmetal Bottom Boards for more than 3 years.

"In pouring steel at high temperatures ranging from 2900 to 2980 degrees F., we have found that our Edco Dowmetal Bottom Boards require replacement much less frequently than wood boards," reports General Foreman Garrett.

"Because we use thousands of bottom boards in our operation," he continues, "the fact that we can stack Edco boards in less than half the space required by wood boards is a real advantage. Our molders prefer Edco *magnesium* Bottom Boards because they are lighter and easier to handle than wood boards."

Lebanon Steel Foundry is typical of scores of foundries, of all types and sizes, that are switching to Edco Dowmetal Bottom Boards because of their performance and *permanence*.

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EDCO DOWMETAL BOTTOM BOARDS

EDCO ALUMINUM CORE PLATES

Please send Facts File including list of 83 standard sizes available from stock.

Name_____

Company_____

Address_____

City-Zone-State_____

Circle 674 on Inquiry Card—Page 203

Obituary

JAMES L. MAHON, 75, former district manager, Detroit plant, American Car & Foundry Co., New York, died Nov. 14. He joined the company in 1898 as a car clerk and later became superintendent clerk, storekeeper and special traveling representative. He was named superintendent of the Detroit plant in 1912, and district manager in 1942. Active in the Detroit Foundrymen's Association, he was its president in 1930. In addition to civic, public and fraternal activities, Mr. Mahon was an enthusiastic supporter and past president of the Old Newsboys Goodfellow Fund and held important positions on the Board of Fire Commissioners, Board of County Supervisors and Industrial Safety Council.

Mike Machacek, 84, president, Northfield Foundry & Machine Co., Northfield, Minn., died Nov. 12. Mr. Machacek began working as a foundry apprentice at 14 years, and was a partner in the New Prague Foundry Co., New Prague, Minn., from 1896 until 1918, when he sold his interest in the company. In 1920 he organized Northfield Foundry and was active in it with his sons until about a year ago when he became semi-retired.

Allison W. Laytham, 51, president, William P. Laytham Sons Co., Paterson, N. J., died Nov. 12. He succeeded his father, William P. Laytham, founder of the company, as president, on the latter's death in 1944. Mr. Laytham attended Brown University. He was a member of New Jersey Foundrymen's Association for over 30 years and was one of its directors for 7 years.

Maxwell H. Tielke, 54, former vice president-treasurer, Crucible Steel Casting Co., Cleveland, died Nov. 15. After graduation from Cornell University over 30 years ago, Mr. Tielke joined the company, which was founded by his father and uncle, and was vice president and treasurer before it was merged recently with Consolidated Foundries & Mfg. Corp., Chicago.

H. Wesley Stokes, 51, part owner and treasurer, Kilbourn Pattern Co., Milwaukee, died Nov. 23. Prior to joining the company 2 years ago, Mr. Stokes was associated with Waukesha Foundry Co., Waukesha, Wis., as pattern superintendent.

Elmer W. Hintz, 55, production manager, Crucible Steel Casting Co., Milwaukee, died Nov. 16. A native of Milwaukee, he was associated there with the former South Side Malleable Casting Co., from 1917 to 1933, when he joined the Crucible company which was under the same ownership.

James C. Romines Sr., 76, co-owner and plant superintendent of the former Southern Pipe & Foundry Co., Knoxville, Tenn., died Nov. 12. Mr. Romines went to Knoxville from Chattanooga at the turn of the century and helped to found the company with which he was associated until he retired in 1937.

William P. Woodside, 79, until his retirement in 1943, vice president in charge of research, Climax Molybdenum Co., Detroit, died Dec. 5 in Phoenix, Ariz. He joined Climax in 1926. Mr. Woodside was one of the founder members of the American Society for Metals.

Paul A. Johnson, 64, one of the founders of Grand Haven Brass Foundry, Grand Haven, Mich., died Nov. 27. Mr. Johnson helped found the company in 1919. He was also a director of Rapidcast Corp., Grand Rapids.

Joseph A. Wohlschlaeger, 37, chief plant engineer, Misco Corp., Chicago, died Nov. 23. A graduate of University of Dayton, he had been with the foundry management firm the last 3 years.

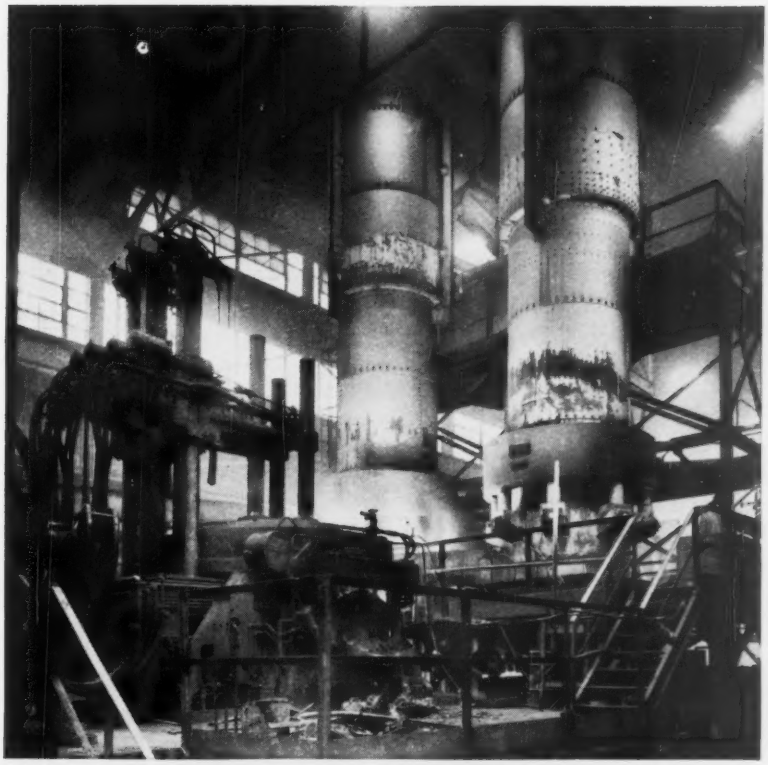
Walter M. Meyer, 54, foundry superintendent in Verona, Pa., for American Steel Foundries, Chicago, died Nov. 13. He had been with the company 20 years.

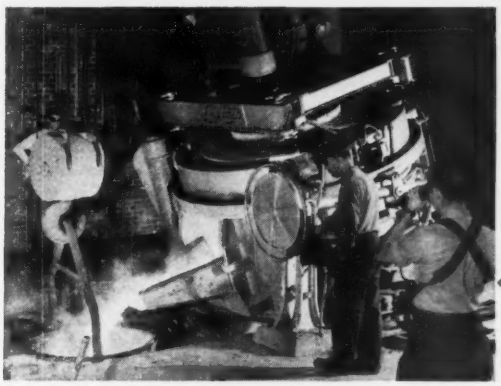
Rushton E. Shirley, 56, secretary-general manager, Indiana Foundry Corp., Muncie, Ind., died Nov. 19. He had been associated with the company about 30 years.

Constructs Aluminum Smelter

Federated Metals Division, American Smelting & Refining Co., New York, will begin construction of a large secondary aluminum smelter at Alton, Ill., early in 1957. The plant will have an annual capacity of 72 million lb of aluminum alloy ingot and will double Federated's present aluminum alloy production.

Lectromelt* Holding Furnace at Fairbanks-Morse foundry helps keep production and quality high





▲ Metal produced in these two 54″ cupolas is run into the Type PT Lectromelt Forehearth Furnace alongside.

◀ The electric furnace provides a ready source for metal whenever it's needed on the pouring floor.

● Gray iron castings for pumps and engines are higher in quality because of this cupola-holding furnace combination at the Fairbanks, Morse & Company foundry in Kansas City. The metal temperature is held constant in the Lectromelt furnace and metal analyses are uniform. These can be readily adjusted to suit any special requirements.

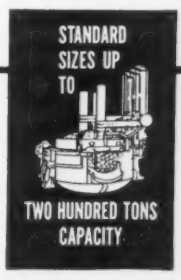
Pouring can continue at an even rate throughout the day, as the Lectromelt furnace provides an 11-ton storage capacity. No dependance on a variable melting rate.

Whether you're wanting to produce metal in an electric furnace or hold and adjust cupola-melted iron, there's a Lectromelt furnace to meet your needs. For a copy of Catalog 9-A describing these furnaces, write Lectromelt Furnace Company, 314 32nd Street, Pittsburgh 30, Pennsylvania. (A McGraw Electric Company Division.)

Manufactured in . . . ENGLAND: Birlec, Ltd., Birmingham . . . FRANCE: Stein et Roubaix, Paris . . . BELGIUM: S. A. Belge Stein et Roubaix, Bressoux-Liege . . . SPAIN: General Electrica Espanola, Bilbao . . . ITALY: Forni Stein, Genoa . . . JAPAN: Daido Steel Co., Ltd., Nagoya

*REG. T. M. U. S. PAT. OFF

WHEN YOU MELT... Lectromelt



Cincinnati will be the scene of the 1957 AFS Castings Congress and a dual event, the Engineered Castings Show. Above is famous Fountain Square in Cincinnati

AFS Pushes Plans for

CONGRESS and CASTINGS SHOW

PLANS are rapidly being advanced for the 61st annual Castings Congress of the American Foundrymen's Society and a dual event, the Engineered Castings Show, both to be held simultaneously in Cincinnati, May 6-10.

Several score foundry exhibitors have already indicated plans for demonstrating their products to a specialized audience of product engineers and castings buyers. Technical divisions and committees of the society have developed a program of special appeal to these design engineers as well as to members of the foundry industry.

The AFS plans dual registration in Cincinnati—at the Music Hall, where the exhibits will be held for the castings show, and at the Netherlands-Hilton Hotel for the regular technical congress. Many of the sessions, especially those directed toward the interest of product engineers, will be held in the Music Hall, including the society's annual business meeting and Charles Edgar Hoyt Lecture. Other technical sessions will be conducted at various downtown hotels.

Some Exhibits Outdoors—Borrowing a page from the spectacular German Foundry Fair held in Duesseldorf last September, the society has taken over a large park adjoining the Music Hall.

It will be used for the open display of huge castings too large for installation in exhibitor booths. Several gray iron and steel foundries have already indicated their intention to utilize this unique exhibit area.

Exhibitors to date include prominent gray iron, steel, malleable, brass and bronze, aluminum and magnesium foundries, as well as die casting producers.

In addition to these, a number of pattern shops will display modern patterns for production of quality castings, the show theme being "Quality, Utility and Economy of Modern Castings."

Well-known manufacturers of laboratory equipment for inspection and control of castings quality, and manufacturers of metals and alloys, will also exhibit. Applications for space are being limited to these four classes of exhibitors, stressing market diversification and product development phases of jobbing foundry work. Exhibits of foundry equipment and supplies companies who have normally exhibited at foundry shows are not being accepted in 1957.

Broad Technical Program—The society's regular technical program will, as in the past, cover all phases of foundry technology and production. Each of the society's eight Technical Divisions—Gray Iron, Steel, Brass & Bronze, Light Metals, Patternmaking, Education, Malleable and Sand—is sponsoring several sessions, roundtables and shop courses. In addition, such committees as Refractories, Industrial Engineering and Costs, Fundamental Papers, and Heat Transfer are arranging sessions. The Safety, Hygiene & Air Pollution Control Program of the society will have two meetings on current phases of the program.

H. Bornstein, formerly of Deere & Co., Moline, Ill., will present the Charles Edgar Hoyt Memorial Lecture on "The Past, Present and Future of Iron Castings." The lecture will follow the society's annual business meeting at which time new officers and directors will be elected and awards presented to first prize winners in the national apprentice contest.

Tentative schedules call for holding the society's annual banquet the evening of May 8, the annual Canadian dinner the night of May 7, and the AFS Alumni dinner on May 9.

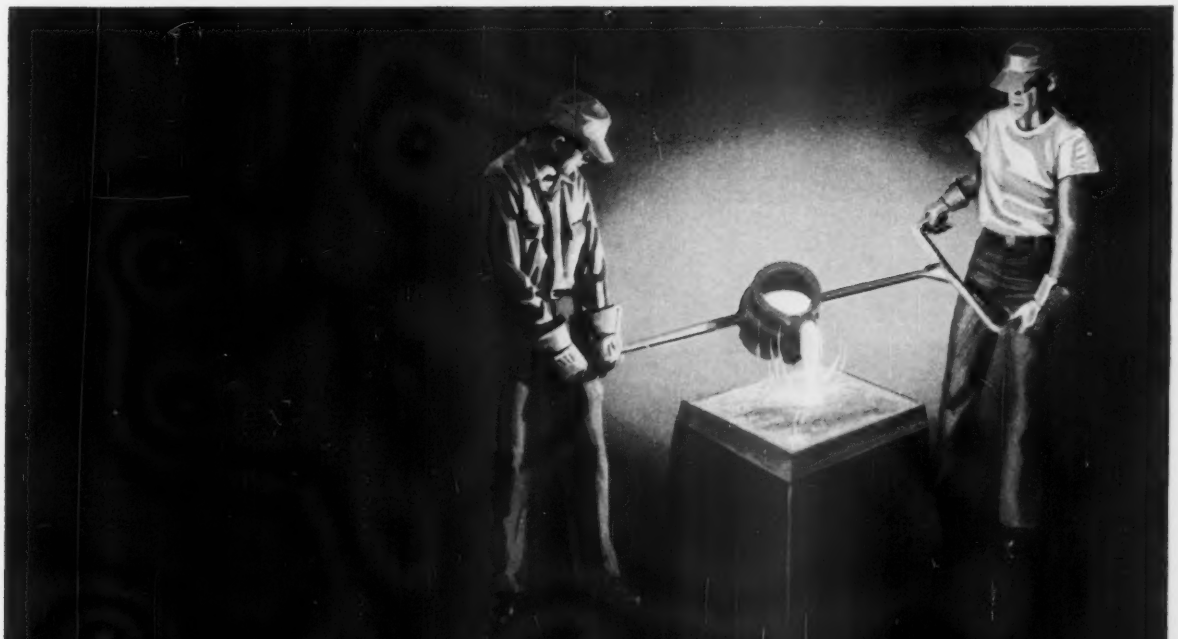
All major hotels in Cincinnati are co-operating in housing the two events, and applications will be available after Jan. 1. As in past years, hotel assignments will be made by an official housing bureau in Cincinnati.

For Design Engineers—The special program of papers for design engineers attending the Engineered Castings Show tentatively includes the following:

"Basic Structures as Steps to Quality Castings," "Status of the Art in Titanium Casting," "Use of Cobalt 60 in Foundry Applications," "New Foundry Testing Methods," "Mechanical Properties of Die Casting Alloys," "Vacuum Die Casting," "Stress Relief of Sand Castings," "Applications of Aluminum Alloyed Copper-Nickel Alloy."

"Effect of Geometry on Properties of Gun Metal and Aluminum Bronze," "Welding Steel Castings With CO_2 as a Shielding Agent," "Plastic Patterns for Foundry Use," "Engineered Light Metal Castings," "Mechanical Properties of Titanium Alloys," "Microstructure vs. Mechanical Properties of Gray Iron," "Tin as a Useful Alloy in Iron Castings," "Grain Refinement of Steel Castings."

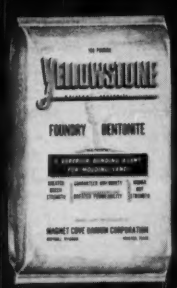
"Die Casting Magnesium Alloys," "Permanent Mold Casting Practice and Properties," "Residual Stress in Iron Castings."



YELLOWSTONE

BENTONITE

for the best casting results



When you really want the best casting results Yellowstone Bentonite is your answer. Complete uniformity is guaranteed because Yellowstone is 100% pure Wyoming bentonite. Due to selective mining, there is a stockpile of 200,000 tons of the finest colloidal bentonite and this bentonite is processed in the world's most modern bentonite plant at Greybull, Wyoming.

Test after test proves Yellowstone Bentonite to have greater green strength and higher permeability. Because of this great strength and superior bonding characteristics, only small amounts of Yellowstone Bentonite and water are needed to temper.

Ask your distributor for Yellowstone Western Foundry Bentonite.

TYPICAL CHEMICAL ANALYSIS OF YELLOWSTONE WESTERN BENTONITE:

	%		%
Moisture	6.64	CaO	0.64
Combined Water	5.90	MgO	1.53
SiO_2	59.92	Na_2O	2.06
Al_2O_3	19.78	K_2O	0.57
Fe_2O_3	2.96	pH in water suspension	9.2

MAGNET COVE BARIUM CORPORATION

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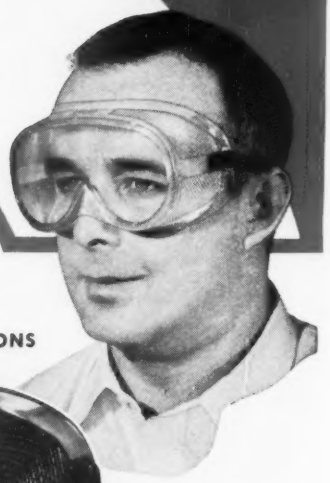
CESCO No. 562
COVERLITE goggles

NEW! Flexible Plastic Goggles MEET WIDE RANGE OF INDUSTRIAL APPLICATIONS



New CESCO No. 565
Flexible Plastic
Goggles

CESCO No. 255
LITE-KLIP safety
spectacles

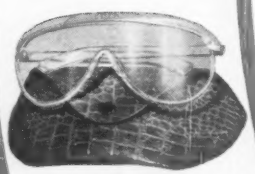
Extremely lightweight and durable—molded from soft vinyl material—these #565 CESCO Flexible Plastic Goggles protect workers from dust, splashing liquids and moderate impact from any direction.

Comfortable to wear • They are perfectly contoured and fit snugly all around. Small perforations, angled away from the eyes, give adequate ventilation.

Give complete protection • They leave no open spaces. Fit perfectly over most personal glasses.

Permit full view • Wide window lenses are curved rather than flat to allow best vision.

Available in two styles • No. 565C (with clear plastic lens) or No. 565G (with green plastic lens).



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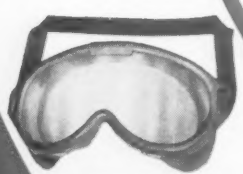


CESCO No. 100
Chemical goggles

ASK your CESCO Safety Equipment Distributor to show you this new goggle and the many other goggles in the complete CESCO line

CESCO C E S C O FOR SAFETY

Foundry Statistics

ALUMINUM

(Shipments of castings—1000 pounds[1])

	Shipments				Unfilled Orders[2]
	Total	Sand	Perm. Mold	Die	
1954	623,054	156,555	214,407	245,291	.....
1955					
Sept.	66,731	14,162	23,090	28,786	112,162
9 mo.	606,124	123,295	221,869	254,893	.....
Oct.	71,667	13,852	25,150	31,829	120,689
Nov.	74,580	13,680	26,284	33,997	127,471
Dec.	74,791	14,655	25,046	34,484	123,881
Total	827,162	165,482	298,349	355,203	.....
1956					
Jan.	74,152	15,861	24,528	33,253	121,924
Feb.	73,096	15,560	23,963	32,949	115,958
Mar.	73,785	16,597	22,816	33,965	110,642
Apr.	67,880	14,732	20,718	31,782	106,477
May	65,786	15,570	19,699	29,814	102,121
June	58,189	13,448	19,067	25,027	102,068
July	52,955	12,398	16,388	23,491	106,620
Aug.	61,407	13,100	18,067	29,553	109,352
Sept.	62,503	12,354	17,855	31,640	111,785
9 mo.	589,753	129,620	183,101	271,474	.....

MALLEABLE IRON

(Shipments of castings—net tons[1])

	Shipments		Standard		Pearlitic		Unfilled Orders[2]
	Total	For Sale	Total	For Sale	Total	For Sale	
1954	812,016	461,982	.....	.....	.....	.....	.....
1955							
Sept.	87,215	55,471	.....	.....	.....	.....	16,636
9 mo.	838,569	495,617	.....	.....	.....	.....	.....
Oct.	90,866	53,804	.....	.....	.....	.....	121,261
Nov.	99,280	58,069	.....	.....	.....	.....	116,981
Dec.	99,946	60,409	.....	.....	.....	.....	123,107
Total	1,104,775	652,552	.....	.....	.....	.....	.....
1956							
Jan.	93,562	54,618	79,406	45,747	14,156	8,871	116,520
Feb.	93,533	54,466	80,601	47,606	12,932	6,860	113,616
Mar.	86,941	46,266	75,384	40,869	11,557	5,397	106,491
Apr.	83,320	47,064	72,763	41,449	10,557	5,615	99,573
May	80,138	51,053	69,593	44,424	10,545	6,629	93,677
June	75,635	45,022	66,300	26,791	9,335	5,513	86,247
July	54,340	31,300	45,977	26,881	8,363	4,419	92,078
Aug.	74,422	43,479	62,567	36,759	11,555	6,720	91,883
Sept.	69,380	41,932	59,071	35,534	10,309	6,368	92,553
9 mo.	711,271	415,170	611,962	346,060	99,309	56,392	.....

COPPER-BASE ALLOY

(Shipments of castings—1000 pounds[1])

	Shipments			Unfilled Orders[2]
	Total	Sand	Perm. Mold	
1954	834,668	751,917	48,848	.....
1955				
Sept.	89,470	80,346	5,611	57,408
9 mo.	739,448	664,014	46,413	.....
Oct.	91,071	82,836	4,517	56,844
Nov.	90,222	80,813	5,808	57,145
Dec.	88,167	78,204	6,373	57,241
Total	1,008,898	905,867	63,111	.....
1956				
Jan.	89,767	80,116	6,135	58,445
Feb.	91,706	82,244	5,888	57,515
Mar.	96,085	85,094	6,299	65,560
Apr.	90,679	81,333	5,835	68,106
May	89,188	80,105	5,448	58,789
June	78,921	70,260	5,052	55,019
July	60,926	55,027	3,193	59,661
Aug.	77,619	70,479	3,805	56,361
Sept.	72,109	64,887	3,930	56,990
9 mo.	747,000	669,545	45,585	.....

MAGNESIUM

(Shipment of castings—1000 pounds[1])

	Shipments		Unfilled Orders[2]
	Total	For Sale	
1954	25,777	22,950	.....
1955			
Sept.	2,468	2,250	5,670
9 mo.	20,978	19,057	.....
Oct.	2,299	2,074	5,394
Nov.	2,324	2,147	5,805
Dec.	2,253	2,016	5,981
Total	27,854	25,294	.....
1956			
Jan.	2,959	2,600	6,237
Feb.	2,977	2,720	6,704
Mar.	3,046	2,842	6,414
Apr.	3,140	2,949	7,137
May	3,021	2,801	7,293
June	2,949	2,765	7,850
July	2,810	2,666	7,937
Aug.	3,059	2,860	8,201
Sept.	3,079	2,863	8,193
9 mo.	27,040	25,066	.....

PRODUCTION WORKERS

Estimated Number

	Sept. 1956	Aug. 1956	Sept. 1955
Ferrous	199,100	203,300	208,700
Nonferrous	63,800	61,500	64,600

Average Weekly Earnings

Gray Iron	84.25	83.84	85.45
Malleable Iron	86.50	82.80	84.65
Steel	95.99	92.99	91.15
Nonferrous	91.69	89.57	87.56

Average Weekly Hours

Gray Iron	40.7	40.7	42.3
Malleable Iron	40.8	40.0	41.7
Steel	42.1	41.7	42.2
Nonferrous	41.3	40.9	41.3

Source: Bureau of Labor Statistics

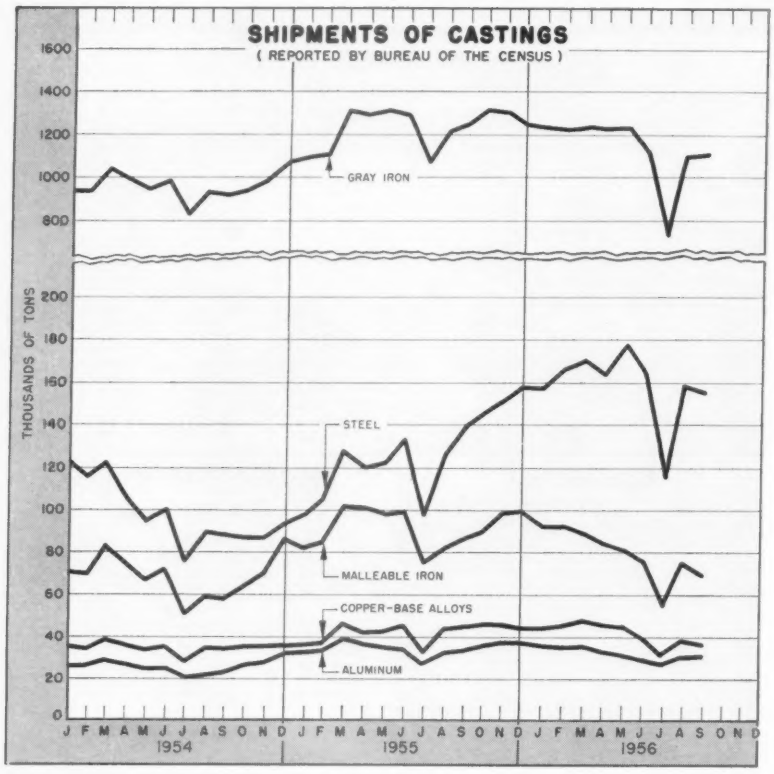
GRAY IRON CASTINGS—SHIPMENTS (Net Tons[1])

	All Castings		Miscellaneous Castings		Heavy Steel Ingot Molds		Chilled Railroad Car Wheels	Pressure Pipe & Fittings	Soil Pipe & Fittings	Unfilled Orders[3]
	Total	For Sale	Total	For Sale	Total	For Sale	Total	Total[3]	Total[3]	
1954	11,532,158	6,322,989	7,292,292	3,064,886	1,784,625	843,899	325,859	1,376,671	743,711	.....
1955										
Sept.	1,252,736	712,688	731,073	314,223	244,199	124,811	29,953	165,332	82,179	1,150,933
9 mo.	11,188,548	6,049,758	6,939,674	2,813,334	1,987,467	1,014,223	308,162	1,256,420	696,825	.....
Oct.	1,310,309	713,671	795,875	327,827	245,749	122,722	31,877	160,875	75,923	1,113,336
Nov.	1,305,633	696,523	797,854	327,580	262,506	127,739	29,795	148,560	66,918	1,061,546
Dec.	1,259,740	633,993	786,480	328,445	262,056	133,115	30,833	133,935	46,436	1,075,477
Total	14,837,745	7,987,205	9,161,685	3,715,963	2,739,864	1,392,209	385,041	1,681,630	869,558	.....
1956										
Jan.	1,249,518	677,017	769,826	326,269	257,150	132,581	32,408	131,346	58,788	1,157,818
Feb.	1,214,769	680,494	739,786	322,956	242,207	128,643	35,074	133,254	64,448	1,140,765
Mar.	1,255,405	715,173	752,498	331,749	254,045	139,624	42,676	132,384	73,802	1,162,578
Apr.	1,218,000	702,145	719,109	314,968	237,486	130,473	39,325	151,670	70,410	1,144,870
May	1,235,631	737,081	702,834	321,413	243,719	131,294	38,419	171,859	78,800	1,086,122
June	1,152,156	686,896	656,778	298,578	217,135	102,405	34,028	170,122	74,093	1,041,315
July	762,611	487,736	509,702	241,771	9,556	7,003	32,484	144,964	65,905	1,109,069
Aug.	1,103,195	671,523	639,953	293,673	170,857	89,589	31,712	180,249	80,424	1,074,461
Sept.	1,109,943	648,784	623,743	282,824	233,823	117,708	35,361	151,081	65,935	1,037,283
9 mo.	10,301,228	6,006,849	6,114,229	2,734,201	1,865,978	979,320	321,487	1,366,929	632,605	.....

STEEL CASTINGS—SHIPMENTS (Net Tons[1])

	All Castings			Carbon			Alloy			Unfilled Orders[3]
	Total	For Sale	Railway Specialties	Total	For Sale	Railway Specialties	Total	For Sale	Railway Specialties	
1954	1,184,096	880,158	135,581	802,321	580,474	120,309	381,285	303,428	15,315	.....
1955										
Sept.	140,843	107,622	23,594	100,775	76,156	21,991	40,068	31,466	1,603	420,616
9 mo.	1,109,769	848,475	166,457	779,934	583,911	153,571	333,209	259,564	12,866	.....
Oct.	145,674	110,409	23,745	105,345	79,235	22,375	40,329	31,831	1,370	418,063
Nov.	152,381	116,908	25,635	111,571	84,064	24,050	40,810	33,518	1,585	453,113
Dec.	158,982	122,201	29,003	116,872	88,894	26,919	42,110	33,307	2,084	475,335
Total	1,530,694	1,166,706	236,880	1,088,489	814,258	219,602	445,769	354,452	17,278	.....
1956										
Jan.	158,618	123,343	27,954	116,092	88,480	26,362	42,526	34,863	1,592	519,401
Feb.	165,398	128,598	30,833	123,279	94,998	29,112	42,119	33,600	1,721	567,330
Mar.	170,045	130,839	31,991	126,583	95,779	29,953	43,462	35,060	2,038	594,990
Apr.	163,708	125,015	27,475	121,723	91,332	25,302	41,985	33,683	2,173	600,242
May	178,227	142,025	35,949	134,919	107,575	33,695	43,308	34,450	2,254	608,275
June	164,661	129,147	31,296	122,483	95,621	28,801	42,178	33,526	2,495	597,103
July	117,984	96,350	19,833	88,971	72,837	18,545	29,013	23,513	1,288	611,233
Aug.	159,831	127,001	32,965	119,025	94,257	30,601	40,806	32,744	2,364	586,496
Sept.	155,046	121,705	33,496	116,905	91,266	31,314	38,141	30,439	2,182	562,937
9 mo.	1,433,518	1,124,023	271,792	1,069,980	832,145	253,685	363,538	291,878	18,107	.....

[1]Source: Bureau of Census. [2]For sale only. [3]All cast iron pipe is shipped for sale.


SHIPMENTS OF CASTINGS
(REPORTED BY BUREAU OF THE CENSUS)
THOUSANDS OF TONS
GRAY IRON
STEEL
MALLEABLE IRON
COPPER-BASE ALLOYS
ALUMINUM
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
1954
1955
1956

COKE PRODUCTION AND CONSUMPTION

(Net tons*)

	Production	Consumption Total	Consumption By Foundries
1954	59,526,723	59,139,159	2,479,926
1955			
Sept.	6,397,133	6,501,013	260,608
9 mo.	55,108,744	55,927,186	2,300,277
Oct.	6,630,609	6,813,118	283,818
Nov.	6,545,862	6,577,008	285,021
Dec.	6,865,032	6,949,073	284,936
Total	75,150,247	76,266,385	3,154,052
1956			
Jan.	6,914,836	6,182,704	275,660
Feb.	6,476,135	6,506,044	260,949
Mar.	6,896,593	6,861,698	267,414
Apr.	6,633,363	6,572,836	247,664
May	6,725,396	6,587,030	241,558
June	6,235,691	6,163,668	214,484
July	2,301,442	1,596,570	193,431
Aug.	5,614,997	5,281,627	225,978
Sept.	6,459,289	6,611,322	212,354
9 mo.	54,257,742	52,363,499	2,139,492

INGOT BRASS AND BRONZE

(Shipments in net tons)

	1955	1956
Jan.	25,201	27,736
Feb.	25,349	24,949
Mar.	29,713	28,310
Apr.	27,641	25,808
May	23,708	23,437
June	23,141	18,842
July	18,513	17,364
Aug.	27,013	23,812
Sept.	26,349	20,929
Oct.	25,228	23,045
Nov.	25,102	.....
Dec.	21,448	.....
Total for year	298,406	166,466

Source: Defense Council of the Ingot Brass and Bronze Industry

ZINC-BASE ALLOY

(Shipments of castings—1000 pounds[1])

	Shipments—Total	Shipments—For Sale	Unfilled Orders[2]
1954	520,458	322,802	.....
1955			
Sept.	61,804	43,272	80,660
9 mo.	560,704	351,986	.....
Oct.	71,529	46,421	85,489
Nov.	74,960	47,433	93,001
Dec.	70,807	47,404	86,120
Total	778,000	493,244	.....
1956			
Jan.	68,050	43,750	83,234
Feb.	66,854	42,300	76,283
Mar.	65,760	42,806	73,025
Apr.	58,274	37,518	71,730
May	52,205	33,920	60,634
June	47,775	31,983	61,809
July	42,227	27,301	64,806
Aug.	52,321	33,281	73,411
Sept.	46,340	33,967	79,390
9 mo.	499,806	326,826	.....

INDEX OF FOUNDRY EQUIPMENT ORDERS

Foundry Trades Only

(Net Orders Closed, New Equipment)

	1955	1956
Jan.	81.0	195.6
Feb.	90.4	169.0
Mar.	163.6	152.7
Apr.	178.6	135.2
May	145.7	207.0
June	186.8	156.7
July	213.4	110.3
Aug.	134.0	188.3
Sept.	156.7	114.7
Oct.	108.6	....
Nov.	154.4	....
Dec.	183.9	....

Note: Figures are percentages of the base period 1947-49 taken as 100 per cent monthly average. This is a new base period. Source: Foundry Equipment Manufacturers Association.

IRON AND STEEL SCRAP CONSUMPTION

(Gross tons*)

	All Scrap Total	By Types of Furnace—Cupola Total	By Types of Furnace—Air Total	By Types of Furnace—Electric Total
1954	54,780,758	8,542,581	855,207	6,100,444
1955				
Aug.	5,913,031	868,644	101,607	765,343
8 mo.	47,212,938	7,097,533	813,017	5,513,258
Sept.	6,060,491	881,158	119,550	753,318
Oct.	6,443,349	944,685	113,411	820,642
Nov.	6,441,351	952,906	112,056	839,971
Dec.	6,496,796	910,675	115,436	830,404
Total	72,654,925	10,786,957	1,273,470	8,757,593
1956				
Jan.	6,688,977	909,201	114,378	880,980
Feb.	6,345,421	892,373	116,418	833,661
Mar.	6,733,076	923,912	101,087	863,950
Apr.	6,490,680	862,233	96,514	842,216
May	6,491,567	855,007	104,485	899,967
June	5,994,989	776,299	87,525	831,456
July	1,986,613	621,064	56,071	399,441
Aug.	5,453,927	803,123	92,200	807,131
8 mo.	46,185,250	6,643,212	768,678	6,358,802

PIG IRON PRODUCTION AND CONSUMPTION

	Production**—Total	Production**—Foundry	Production**—Malleable	Production**—Basic	Production**—Low Phos. Intermediate Low Phos. & Bessemer	Consumption*—Total	Consumption*—Cupola	Consumption*—Air	Consumption*—Electric
	(Standard grades—net tons)					(By type of furnace—gross tons)			
1954	58,113,924	2,241,436	2,798,646	47,485,047	5,587,465	52,373,541	4,364,418	215,158	155,258
1955									
Oct.	6,905,280	267,405	315,045	5,647,527	675,303	6,193,512	470,610	22,659	23,328
10 mo.	63,526,723	2,374,784	3,203,367	51,444,259	6,514,313	55,840,479	4,412,590	213,867	206,287
Nov.	6,636,649	241,727	353,713	5,404,584	636,625	5,973,223	469,485	22,621	18,148
Dec.	6,887,667	242,446	329,607	5,660,307	655,307	6,131,680	444,459	23,520	21,971
Total	77,114,073	2,858,957	3,884,971	62,570,394	7,799,751	68,944,698	5,326,534	260,008	246,406
1956									
Jan.	6,985,945	210,755	317,216	5,806,140	651,774	6,275,224	441,634	24,062	11,766
Feb.	6,539,199	229,440	370,208	5,350,650	588,901	5,871,824	430,792	24,307	13,010
Mar.	7,083,877	196,533	352,856	5,843,852	690,636	6,316,836	427,177	23,737	18,725
Apr.	6,860,833	210,319	333,660	5,623,647	693,207	6,077,074	413,537	22,757	17,179
May	6,873,102	232,375	329,750	5,625,067	685,910	6,064,632	413,494	24,074	28,596
June	6,387,608	213,769	331,871	5,227,488	614,480	5,642,004	379,803	22,039	23,460
July-Aug.	6,190,197	337,077	382,369	4,854,291	616,450	963,749	303,341	14,702	5,582
Sept.	6,873,064	236,809	316,590	5,636,000	683,665	4,618,718	404,948	22,719	17,604
Oct.	7,245,650	245,762	321,188	6,000,279	678,421	.....	.....	.....	.....
10 mo.	61,039,475	2,112,839	3,055,768	49,967,414	5,903,444	.....	.....	.....	.....

*Source: U. S. Dept. of Interior. Bureau of Mines. **Source: American Iron & Steel Institute. [1]Source: Bureau of the Census. [2]For sale only.

AUTOMATIC AIR-TO-AIR CONTROL assures

#21 Type "C" Airomatic
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Heavy Duty Jolt & Power Squeezer Drag Molding Machine with Pneumatic Pattern Draw. Equipped with air operated car type squeeze head and built-in flask roll-in and mold roll-out device with measuring sand hopper, flask indexing device and sand spill upset, flask feed-in elevator, mold turn-over and mold transfer.

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• FOR HALF A CENTURY THE BEST IN MOLDING EQUIPMENT

Meditations of a Sandman

By HAROLD E. HENDERSON
H. C. Macaulay Foundry Co.
Berkeley, Calif.

"Green Sand or Shell?"

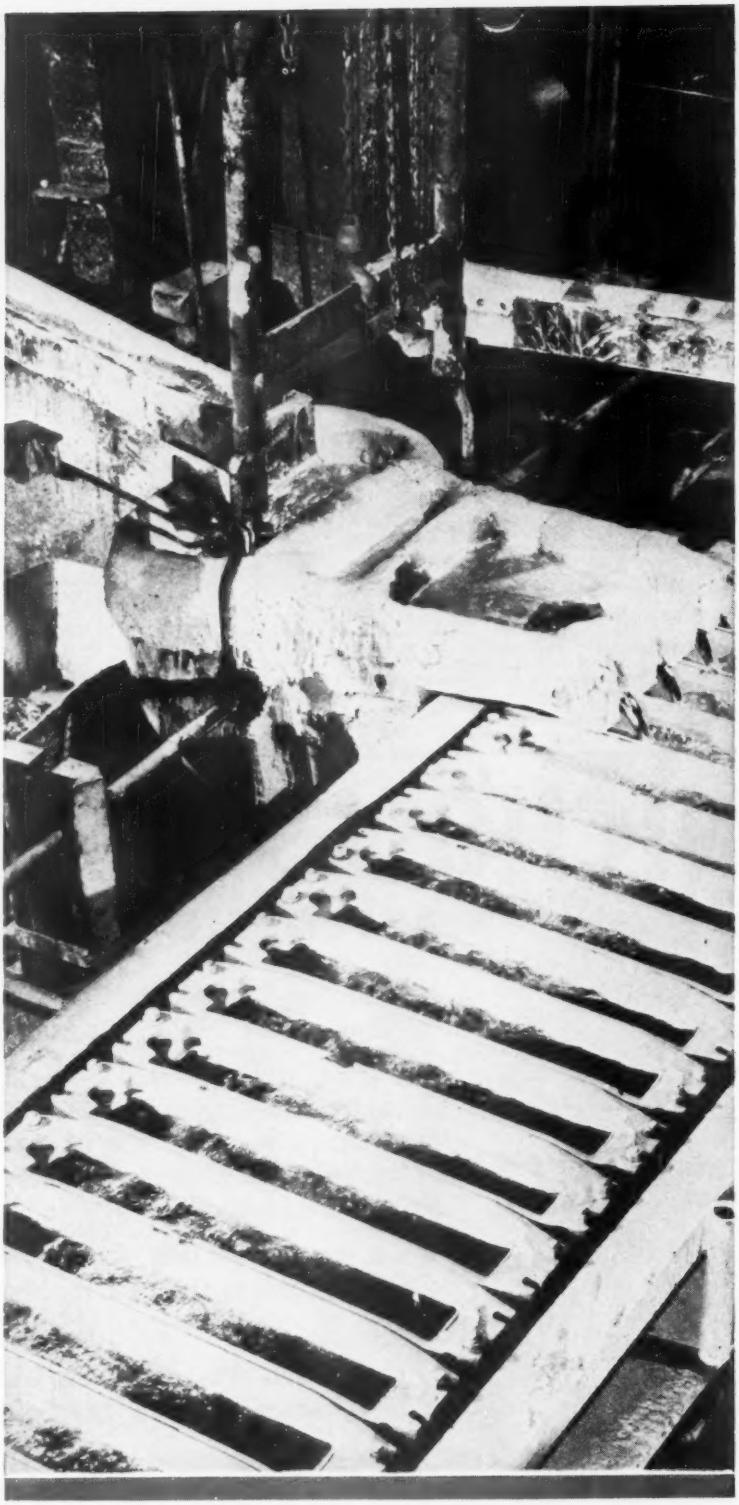
IT IS recorded that Mark Twain attended a church service at which the minister had taken as his text, "Which shall it be, Heaven or Hell?" We shall assume that in the discourse, which lasted well over an hour (Mark considered it too long), this matter of final human destination must have been covered pretty thoroughly.

At the conclusion of the service, as Mark was leaving the church, a lady of his acquaintance tapped him on the arm. "Wasn't that a wonderful sermon, Mr. Clemens? What is your reaction to our minister's description of the upper and lower regions?" Mark paused thoughtfully, then drawled, "Madam, I would rather not express a positive opinion. You see, I have friends in both places."

I feel a considerable sympathy for Mark Twain in the incident described. In the current debate on shell vs. green sand molding, I too have friends in both camps. Unlike the diplomatic Mr. Clemens, however, I cannot pretend to be neutral on the subject.

Here on the West Coast (and I presume even more in the East), the subject of shell molding has been publicized in prodigious detail. Both from platform and printed page, we have been bombarded with material purporting to prove its unquestionable superiority over green sand practice.

I have several friends who presently are engaged in shell practice. Most of them are dealing with it experimentally, like the small boy, anxious to swim, who sits on the bank and skeptically wiggles his toe in the water, but can't make up his mind to take the plunge. After a man has spent time, effort and some good money attempting to develop a new molding process, then finds that it is not economically feasible for his requirements, he may privately hang



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his head, but you hardly can expect him to announce his failure publicly.

So it is when a man finds that shell molding simply is not for him. He was told that the greater part of his work—even jobbing—could be converted from green sand to shell, with casting quality vastly improved, production increased, cost lowered, customers clamoring to pay a higher price because of substantial savings to be expected in the machine shop. Then, as a final clincher, he was told that unskilled labor could operate the whole shebang!

Here was a panacea indeed! No more green-sand trouble—no more blows, scabs, cuts, washes, rat-tails, buckles, drops, rough or swollen castings and uncontrolled clay or water! Hallelujah! Can you blame a sand-troubled foundryman for this promise of deliverance from the ills that beset him?

If, gentle reader, you have followed me this far, then I am willing to hazard the guess that you surpass me in the knowledge of shell molding. I therefore respectfully ask whether you would be willing to endorse the rather extravagant claims, mentioned above, which some of the more enthusiastic proponents of this process have advanced.

I am told that certain foundries are now operating with entirely shell molds and cores and that the entire performance is all and more than was anticipated at the outset. I also am informed that the automotive industry is pouring hundreds of tons of iron each day into camshaft and crankshaft shell molds and that results are decidedly gratifying. This is good news indeed and speaks well for the progressive spirit of the modern foundryman. I rejoice in his success and am selfishly grateful to him or anyone else who steps out boldly to advance our knowledge of foundry sand practice. These brave souls who are pinning their faith to shell cores and molds have done more to stimulate and improve green sand practice than anything that has happened since the advent of synthetic—I beg your pardon. "formulated"—sand.

By providing a smoother and more attractive casting surface, together with closer tolerances, the shell people have added a new dignity to the casting industry. They have to a considerable extent restored buyer respect in a product—a respect that was being sacrificed by apathetic foundrymen. But more than this they have indicated forcefully that the casting buyer is no longer at the mercy of the foundryman who has not improved his sand practice in a

quarter of a century. The shell molder has provided the new look in castings—and unwittingly challenged the green sand boys to match his performance.

I have good reason to believe that the challenge is being accepted in all of its implications. Thanks to the shell molder, conventional sand practice is on the eve of a renaissance.

Despite the fact that we have seen shell castings which fell far short of desired excellence, no one in his right mind will deny that when all operations and conditions are properly controlled, the shell product is a thing of both precision and beauty. Of especial importance is the shell core, even in the green sand mold.

Castings made by the shell process undoubtedly will enjoy an expanding market, and thus advance the casting industry. But instead of foreshadowing the doom of green sand (as some sorrowfully predicted), they will, in the very essence of competition, provide the incentive necessary to make foundrymen achieve the performance of which green sand is capable.

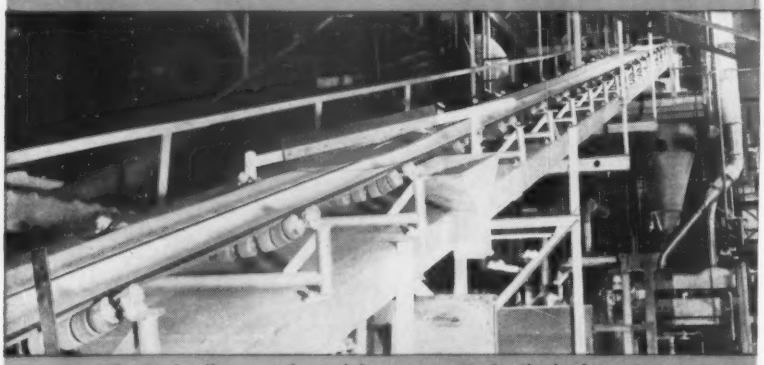
There will be foundrymen tomorrow, if not today, who will develop their green sand practice to a point where casting quality and appearance will so closely parallel that of shell, as to be indistinguishable. How will this be done? Why, simply by following the advice of our recognized experts, the men whose speeches and writings we applaud, but then for the most part ignore.

These men have pleaded with us to open our purses a little wider, invest in better patterns and equipment, better coreblowers and molding machines, better sand held to desired specifications and, finally, to adopt dependable controls at all points of operation. Does this order sound too big for you? Why not confer with your nearest successful shell foundryman?

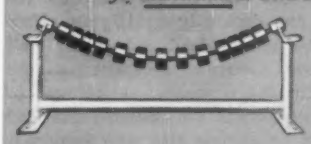
Ask him for a complete rundown on the cost of his process—original investment, suitable patterns and coreboxes, sand, binder, fuel, power and man-hour production? Then go back to your plant resolved to invest a like amount to improve the quality of your green sand practice. When you do this, you need no longer fear the competition of the shell molder. Instead, you will commend him gratefully in your prayers.

Many of us in jobbing shops have only begun to adopt means and methods of practical sand conditioning. The best of machines today will be considered inadequate by tomorrow's standards. We must revise our thinking on grain distribution, screening, cooling, aeration and aging. We should provide a final degree of aeration and "fluffing" as our sand falls from the belt or elevator buckets into the molder's hopper, so that it finally covers the pattern in a velvety, feathery condition, soft to the touch, flowable as mercury—and, when the metal reaches it, stable as concrete.

FORD Foundry uses JOY LIMBEROLLER Belt Conveyor Idlers



Joy Limberollers at work on a belt conveyor at Ford's Cleveland Foundry.



This radical, new idler is used in handling abrasive foundry sands at Ford's Cleveland Foundry. Each idler is a single roller consisting of a series of pressure-molded neoprene or rubber discs on a flexible steel cable. Only two bearings are used and these are up out of the dirt zone.

Joy's new belt conveyor idler has already given over *twelve times* the service life of conventional idlers in handling many difficult materials . . . abrasive foundry sands, coal, petroleum coke, potash, copper ores, mill tailings, iron ore, wet concrete, triple super-phosphate, ammonium sulphate and sticky fertilizers.

The Limberoller is unaffected by most corrosives that damage steel . . . is ideal for chemical, sulphur and salt plants.

Get details from ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

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American industry, led by the Air Force, Navy and Atomic Energy Commission, will buy more ultrasonic equipment in 1957 than in all previous years. That prediction was made Nov. 14 at an ultrasonics symposium held at the Yale Club, New York.

"Silent" sound waves can detect hidden flaws in metal, measure thickness of metal parts from one side, degas molten metals and are of use in quenching oil baths for heat treating and in pickling and descaling metals. Outside the field of metalworking, they have scores of other applications, including cleaning, degreasing and many others.

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501. Industrial Brushes

Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, O. — Illustrated catalog 210-C, "Brushes for Industry," contains detailed information on the selection and use of power brushes, Brushamatic machines, paint and varnish brushes and maintenance brushes. The Brushamatic machines can perform rough as well as precise finishing operations in any degree of mechanization desired.

502. Melting Furnaces

Ajax Engineering Corp., Trenton 7, N. J.—Folder R-42 describes and diagrams a line of frequency induction melting furnaces in a zinc and aluminum die casting plant. Arrangement of furnaces, casting machines and molten metal distribution system are highlighted.

503. Gray Iron Survey

Gray Iron Founders' Society, National City-East Sixth Bldg., Cleveland 14, O.—"Survey Report to Product Engineers" summarizes a study made by the GIFS in questionnairing product designers, engineering department managers, chief engineers and others to learn what foundries can do to aid product engineers.

504. Shell Molding Resins

Barrett Division, Allied Chemical & Dye Corp., 40 Rector St., New York 6, N. Y.—Booklet, "Plaskon Resins for Shell Molding," describes the shell molding process with emphasis on the foundryman's problems including design and production considerations, available types of equipment, gating techniques and precautions, pattern design, resin bonding of shell molds to insure tightness at the parting line, special metals handling and sand reclamation.

505. Sand Mullers

Beardsley & Piper Division, Pettibone Mulliken Corp., 2424 North Cicero Ave., Chicago 39, Ill.—Bulletin 1220 discusses various aspects of sand mulling with emphasis on the advantages of the Speedmullor as the key unit in a sand preparation system. Engineering data, performance charts, typical installations and operating and control information also are provided.

506. Universal Blowplate

Dodge Steel Co., 6501 Tacony St., Philadelphia 35, Pa. — Construction and operation features, advantages, design details and miscellaneous data on the McKee-Dodge universal blowplate for coreblowing is contained in catalog.

507. Radiant Tube Burner

Eclipse Fuel Engineering Co., Rockford, Ill.—Catalog H-46 presents specifications, dimensional diagrams, optional ranges, tube sizes, regulation and ignition features of RT radiant tube burners for use in industrial ovens, furnaces and muffles.

508. Castable Refractories

Norton Co., Worcester 6, Mass.—Technical information on Alundum 33-1 castable—a lightweight insulat-

FOUNDRY INQUIRY CARD Circle item number for further information on anything described or advertised in this issue **JANUARY 1957**

401	426	451	476	501	526	551	576	601	626	651	676	701	726
402	427	452	477	502	527	552	577	602	627	652	677	702	727
403	428	453	478	503	528	553	578	603	628	653	678	703	728
404	429	454	479	504	529	554	579	604	629	654	679	704	729
405	430	455	480	505	530	555	580	605	630	655	680	705	730
406	431	456	481	506	531	556	581	606	631	656	681	706	731
407	432	457	582	507	532	557	582	607	632	657	682	707	732
408	433	458	483	508	533	558	583	608	633	658	683	708	733
409	434	459	484	509	534	559	584	609	634	659	684	709	734
410	435	460	485	510	535	560	585	610	635	660	685	710	735
411	436	461	486	511	536	561	586	611	636	661	686	711	736
412	437	462	487	512	537	562	587	612	637	662	687	712	737
413	438	463	488	513	538	563	588	613	638	663	688	713	738
414	439	464	489	514	539	564	589	614	639	664	689	714	739
415	440	465	490	515	540	565	590	615	640	665	690	715	740
416	441	466	491	516	541	566	591	616	641	666	691	716	741
417	442	467	492	517	542	567	592	617	642	667	692	717	742
418	443	468	493	518	543	568	593	618	643	668	693	718	743
419	444	469	494	519	544	569	594	619	644	669	694	719	744
420	445	470	495	520	545	570	595	620	645	670	695	720	745
421	446	471	496	521	546	571	596	621	646	671	696	721	746
422	447	472	497	522	547	572	597	622	647	672	697	722	747
423	448	473	498	523	548	573	598	623	648	673	698	723	748
424	449	474	499	524	549	574	599	624	649	674	699	724	749
425	450	475	500	525	550	575	600	625	650	675	700	725	750

751	761	771	781	791	801	811	821	831	841	851	861		
752	762	772	782	792	802	812	822	832	842	852	862		
753	763	773	783	793	803	813	823	833	843	853	863		
754	764	774	784	794	804	814	824	834	844	854	864		
755	765	775	785	795	805	815	825	835	845	855	865		
756	766	776	786	796	806	816	826	836	846	856	866		
757	767	777	787	797	807	817	827	837	847	857	867		
758	768	778	788	798	808	818	828	838	848	858	868		
759	769	779	789	799	809	819	829	839	849	859	869		
760	770	780	790	800	810	820	830	840	850	860	870		

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ing castable recommended for temperatures up to 3300° F and Alundum 33-D castable—a heavy duty castable made of pure aluminum oxide in dense grain form for protection under severe conditions is provided in bulletin 1992.

509. Single Line Buckets

Blaw-Knox Co., Blaw-Knox Equipment Division, Box 1198, Pittsburgh 30, Pa.—Bulletin 2232-R presents selection data and installation methods for single line hook-on or direct-reeved type clamshell buckets for single drum hoists or two-line hook-on type buckets for cranes equipped with two hook blocks.

510. Core and Mold Coatings

Thiem Products Inc., Milwaukee 14, Wis.—Bulletin 56-1 covers high refractory core and mold coatings, core oils and other sand conditioners formulated for gray iron and engineered for foundry requirements.

511. Dust Control

Pangborn Corp., 1400 Pangborn Blvd., Hagerstown, Md.—Bulletin 922, "Dust Control for Industry," encompasses a complete range of dust control equipment and accessories and describes the importance of dust control to industry in relation to reduced maintenance costs, employee morale and use of dust by-products.

512. Lubricants

VanGuard Solid Lubricants Inc., 57 East 73rd St., Dept. 4-A, New York 21, N. Y.—Technical notes No. 755VH cover two molybdenum disulfide compounds designed to meet tough lubrication requirements. One, Molyglide 256-V, is said to have infinite applications. The other, Molyglide 156-P, is a multiduty lubricant designed for general use where heat above 300° F is not a factor.

513. Epoxy Tooling

Houghton Laboratories Inc., 322 Houghton Ave., Olean, N. Y.—Technical data sheets T-1 and T-24 provide comparative data on Hysol epoxy plastic tooling materials and a description of the materials and some of the techniques for their use in duplicating patterns.

514. Magnets

Ohio Electric Mfg. Co., 5400 Dunham Rd., Maple Heights, Cleveland, O.—Bulletin 150-A describes rectangular and rail handling magnets ranging in size from 19 x 32 in. up to 28 x 74 in., with supplementary data on construction materials, headroom required and dimensions.

515. Wirebound Pallet Boxes

General Box Co., 1825 Miner St., Des Plaines, Ill.—Catalog on Generalift standard industrial wirebound wooden pallet boxes illustrates and describes ways that pallet box bulk handling can be applied to solve material handling problems. Complete specifications are included.

516. Pressure Gages

American Chain & Cable Co., Helicoid Gage Division, 929 Connecticut Ave., Bridgeport 2, Conn.—Bulletin DH-23 features line of pressure and chemical gages that can be used on engines, turbines, blowers, hydraulic presses, tractors, pumps and compressors or wherever a gage is subjected to violent pressure pulsations or severe mechanical vibrations.

517. Pattern Coating

Carboline Co., Division of Mullins Non-ferrous Castings Corp., 331 Thornton Ave., St. Louis 19, Mo.—Bulletin A-60 offers general application information on CK Resin, a hard, durable, glossy thermosetting resin coating for protecting wood patterns against wear and dry rot and Carbo-Fix Cement, a thermosetting resin which adheres to wood so strongly that it cannot be separated from the wood.

518. Pressure Boosters

Miller Fluid Power Co., Division of Flick-Reedy Corp., 2040 North Hawthorne Ave., Melrose Park, Ill.—Engineering, installation, mounting and operating data on fluid pressure boosters and accumulators are provided in bulletin B-200. Boosters have input range of 40 to 3000 psi air or fluid to an output range of 200 to 10,000 psi fluid.

519. Laboratory Service

Frank L. Crobaugh Co., 1426 West Third St., Cleveland 13, O.—Information sheet covers laboratory service to foundries for research, development, engineering, quality control and testing.

520. Rust Preventive

Harry Miller Corp., 4th and Bristol Sts., Philadelphia 40, Pa.—Booklet describes Immunol—a nonalkaline, nonacid detergent and rust preventive that cleans, degreases and rust-proofs metal in one operation.

521. Welding Manual

Eutectic Welding Alloys Corp., 40-40 172nd St., Flushing 58, N. Y.—Second edition of Eutectic Welding

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Institute manual is in seven sections devoted to improved welding of steels, stainless steels, nickel and nickel alloys, cast iron, aluminum, copper and copper alloys and difficult-to-weld base metals such as magnesium.

522. Flow Measurement

Selas Corp. of America, Dresher, Pa.—Applications and performance and selection data of Series F Flo-Scope for flow rate measurement of air and gases are provided in bulletin SC-1022. Instrument can be used wherever air and noncorrosive gases are transferred from one place to another, through piping at moderate temperatures and pressures.

523. Anti-Seize Compound

Crane Packing Co., 1800 Cuyler Ave., Chicago 13, Ill.—Folder PLS-510 offers general information on Thred-Gard, a high temperature anti-seize compound that lubricates and protects the threaded surface of studs, bolts and plugs, permitting their reuse many times over.

524. Refractory Castables

Walsh Refractories Corp., 101 Ferry St., St. Louis 7, Mo.—High temperature and lightweight insulating refractories are featured in bulletin CS-1. A list of uses for each product is furnished together with mixing and pouring instructions, curing and drying.

525. Induction Melting

Inductotherm Corp., 412 Illinois Ave., Delanco, N. J.—Engineering features, performance data and general information on Inducto induction melting furnaces and related equipment are provided in bulletin 70.

526. Silicone Products

Dow Corning Corp., Midland, Mich.—Annual reference guide to Dow Corning silicones describes about 150 commercially available silicone products, including several which were developed within the past year. Charts, tables and graphs compare silicones with the materials they are replacing.

527. Lighting Accessories

Thompson Electric Co., 1173 Power Ave., Cleveland 14, O.—Bulletin TH-56 shows typical installations and general specifications of patented hangers that permit a maintenance man to lower inaccessible overhead lights to floor level for servicing and then return them to operating position.

528. Hydraulic Cylinders

Benton Harbor Engineering Works Inc., Benton Harbor, Mich.—Folder details engineering and operating features of custom built hydraulic cylinders that will lift, tilt, lower, eject, reciprocate, swing, turn, clamp, hold or squeeze.

529. Vises and Work Holders

Universal Vise & Tool Co., Parma, Mich.—Catalog 9156 contains data on machine tool vises, angle vises, adjustable angle plates, lathe fixtures, safety work holders for drill presses, quick-acting vises and parallel clamps.

530. Alloys Wall Chart

Henning Bros. & Smith, 91-127 Scott Ave., Brooklyn 37, N. Y.—Wall chart details information on 37 standard brass, bronze and nickel silver casting alloys, their Navy, SAE, ASTM and Federal specification designations and the chemical composition by percentages of ingredient metals.

531. Research

Allis-Chalmers Mfg. Co., 1032 South 70th St., Milwaukee 1, Wis.—Bulletin 48B8448 covers facilities at company's Central Research Laboratories involving electrical, mechanical, physics, nuclear, chemical, metallurgical and processing research projects.

532. Hoists and Trolleys

Yale & Towne Mfg. Co., 11,000 Roosevelt Blvd., Philadelphia 15, Pa.—Key features and specifications of hand hoists, Pul-Lifts and plain and geared hand hoist trolleys are found in catalog.

533. Wheel Specifications

Electro Refractories & Abrasives Corp., 344 Delaware Ave., Buffalo 2, N. Y.—Bulletin GD-56 on grinding wheel specifications and marking data

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422	447	472	497	522	547	572	597	622	647	672	697	722	747
423	448	473	498	523	548	573	598	623	648	673	698	723	748
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756	766	776	786	796	806	816	826	836	846	856	866		
757	767	777	787	797	807	817	827	837	847	857	867		
758	768	778	788	798	808	818	828	838	848	858	868		
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760	770	780	790	800	810	820	830	840	850	860	870		

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contains a chart explaining the system by which grinding wheels are marked according to abrasive material, grain size and combination, grade, structure and bond.

534. Fuel Burning Systems

Orr & Sembower Inc., Morgantown Rd., Reading, Pa.—Bulletin 1231-A describes a packaged combustion fuel burning assembly using gas, oil or combination gas-oil firing for modernizing or converting existing boiler equipment or for obtaining efficient operation from new equipment.

535. Coke Dust Control

Wheelabrator Corp., 1102 South Byrkit St., Mishawaka, Ind.—Use of local exhaust ventilation and cloth tube type dust collectors for control of dust from coal and coke handling operations are discussed in bulletin 551-D.

536. Furnace Lining Tools

Inductotherm Corp., 412 Illinois Ave., Delanco, N. J.—Vol 1, No. 2 of *Inducto Metal Melting News* covers a ramming tool designed for ramming linings in induction melting furnaces. A procedure for ramming these linings also is included.

537. Pneumatic Controllers

Bristol Co., Waterbury 20, Conn.—High sensitivity, wide control-band controllers for temperature, pressure, flow and vacuum applications are illustrated and described in bulletin A130.

538. Dispersions

Acheson Colloids Co., Division of Acheson Industries Inc., Port Huron, Mich.—Compilation of current practice in high temperature lubrication, including die casting and permanent mold applications, is contained in bulletin 423.

539. Refractory Gun

True Gun-All Equipment Corp., Box 2526, Tulsa, Okla.—Specifications, operating features and pricing information on equipment for pneumatically applying concrete, refractories or other cementitious materials is offered in bulletin GA156.

540. Conveyors

Mathews Conveyor Co., Ellwood City, Pa.—Catalog provides specifications, load ratings, engineering data and general information on complete line of roller and wheel conveyors designed to handle loads weighing from a few ounces to 50,000 lb.

541. Vibration Dampeners

J & H Products Co., 3007 Elm St., Dallas 26, Tex.—Form 114 and bulletin 51 illustrates and describes operating characteristics of vibration dampeners for right angle head grinders, air or electric. Dampeners can be used with raised hub disk wheels and abrasive disks.

542. Magnetic Inspection

Magnaflux Corp., 7300 West Lawrence Ave., Chicago 31, Ill.—Form 151, "Magnaflux-Magnaglo Magnetic Particle Inspection," outlines some basic data on magnetic particle inspection and some of its variations to suit many different needs.

543. Industrial Belting

Imperial Belting Co., 1750 South Kilbourn Ave., Chicago 23, Ill.— Descriptions, installation photographs, recommendation charts and technical data on Innerlocked stitched canvas belting for conveyors, elevators and power transmission applications are found in catalog.

544. Protective Coatings

Markal Co., 3052 West Carroll Ave., Chicago 12, Ill.—"Stop Costly Metal Destruction" contains information on protective coatings designed to protect metals from scaling and corrosion at temperatures as high as 2100° F. Four basic coatings are described with data on uses, methods of applying and temperature ranges.

545. Exhaust Systems

American Agile Corp., Box 168, Bedford, O.—Brochure on corrosion-proof ventilating and exhaust systems covers thermoplastic centrifugal fans, ducting and fittings and hoods. Model specifications and details on various positions and arrangements to meet different operating conditions are included

546. Plugs and Jacks

Minneapolis - Honeywell Regulator Co., Industrial Division, Wayne & Windrim Aves., Philadelphia 44, Pa.—Specification S005-1, "QuiK-Konnect Thermocouple Components," describes a system of connectors (plugs, jacks, jack panels and hardware) for thermocouples and lead wires.

547. Flexible Couplings

Morse Chain Co., Industrial Sales Division, Ithaca, N. Y.—Torsional deflection charts, dimensions, instructions for use and specifications on standard, double and radial type flexible couplings are found in catalog C 41-56.

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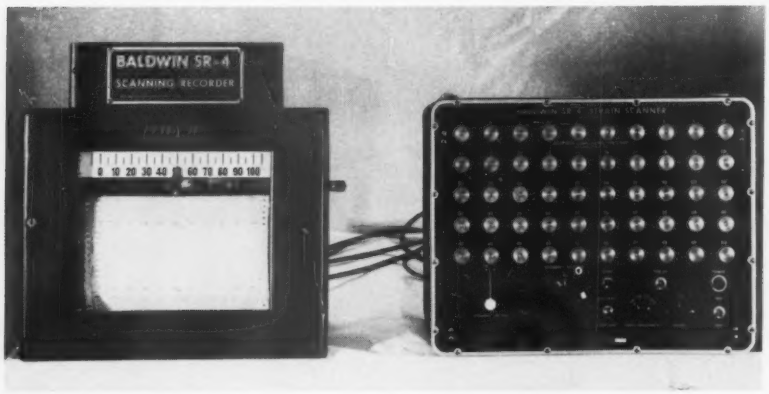


Scanning Recorders

offer rapid plotting and broad gage accommodation

Baldwin-Lima-Hamilton Corp., Electronics & Instrumentation Division, Dept. SO-59, Waltham, Mass.—Automatic scanning recorders for SR-4 strain gages and SR-4 transducers have been improved to accommodate both two and four strain gage bridges, to provide greater flexibility of operation and more useful data presentation and to offer an additional lower strain range. The recorders consist of three units—the recorder cabinet (left), the cabinet containing the switching and balancing unit (right) and the rotating hand (lower left) which shows the channel in use at any instant. The recorders reportedly reduce the time and skill required to conduct multipoint load-strain tests on structures because they plot per cent of load versus strain curves for each channel directly on a chart.

For More Details Circle No. 401—Page 203

Core Binder

offers rapid room-temperature curing of deep, heavy cores

Archer-Daniels-Midland Co., 2191 West 110th St., Cleveland 2, O.—Lin-O-Set II is an air setting core binder adaptable to heavy cores which is said to offer rapid room temperature curing even at the bottom of deep coreboxes. Once green bond begins to develop on the core surface, a hardness reaction is developed through the entire depth of the core to cut down the waiting time for complete cure before stripping.

For More Details Circle No. 402—Page 203

High-Purity Magnesium

is available in volume from company's production facilities

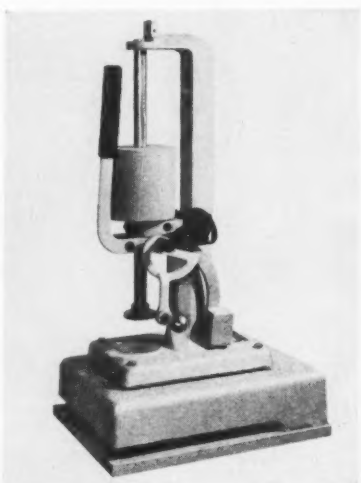
Dow Chemical Co., Midland, Mich.—Magnesium pig and ingot in purities above 99.9 per cent is available in volume from company's expanded production facilities. Material is used in producing titanium, zirconium, beryllium and uranium priority defense metals.

For More Details Circle No. 403—Page 203

Sand Ramming Device

produces specimens to same hardness as that used in foundry

Harry W. Dietert Co., 9330 Roselawn Ave., Detroit 4, Mich.—No. 313-1 rammer weight adjustable drop attachment is for producing 2 x 2-in. sand specimens rammed to any desired green hardness. Accessory can be mounted on a No. 315 sand rammer where it may be adjusted to produce any effective cam rise up to 2 in. By varying the cam rise, the operator may change the height from which the rammer weight is dropped to produce specimens rammed to the same green hardness as that used in the foundry. A similar attachment is available for rammers making 1⅛ x 2 in. specimens.

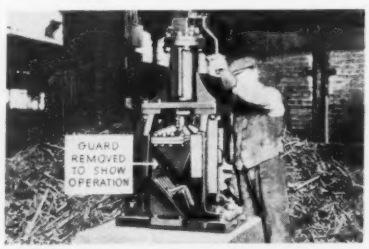


For More Details Circle No. 404—Page 203

Rod Straightener

permits foundrymen to salvage core rods and gaggers for reuse

Wheelabrator Corp., 1102 South Byrkit St., Mishawaka, Ind.—Core rod straightener and shear machine permits foundrymen to use the same core rods and gaggers several times. The machine reportedly will operate as fast as material can be fed into it. Two heavy alloy steel dies



straighten one rod at a time. Machines are made in four sizes to meet requirements of most shops. Rods from ⅜ to 2½ in. in diam can be straightened in the dies, and rods up to 1½ in. in diam can be sheared. A gagger-forming attachment is available as optional equipment. It will accommodate rods up to ⅝-in. in diam and is reputed to make a perfect right-angle bend in only one operation.

For More Details Circle No. 405—Page 203

Heating Furnace

is designed for annealing, heat treating and normalizing

L & L Mfg. Co., 136 Eighth St., Upland 86, Delaware County, Pa.—Furnace is designed for annealing, heat treating and normalizing applications where regulation of gradients must be controlled closely. Temperature range is from 300 to 2200°F. Capacity is sufficient to heat 2000 lb of steel from 100 to 2000°F in four hours. Interior dimensions are 36 in.

For More Details on These Items
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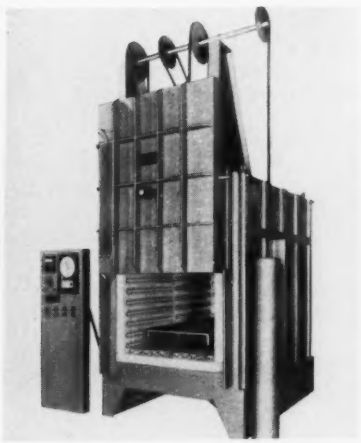


high from top of hearth plate to spring of arch, 40 in. wide, 44½ in. to center of arch and 72 in. deep. Firing chamber temperature gradients are controlled by a system of input controllers, zone located thermocouples, a recorder controller and a thermocouple selector switch.

For More Details Circle No. 406—Page 203

Flexible Mold Compound

is for making molds for duplicating plaster and epoxy models

Smooth-On Mfg. Co., 572 Communipaw Ave., Jersey City 4, N. J.—Poly-Flex 100 is a cold-setting flexible mold compound that can be used to make synthetic rubber molds that can duplicate plaster and epoxy models and patterns with great fidelity. Material is a two-component liquid system consisting of a combination of low viscosity liquid polymers and a hardening agent. The mixture begins to harden in about one hour and reaches working strength in 16 hours, maximum strength in 24 hours.

For More Details Circle No. 407—Page 203

Pneumatic Unloader

is portable and attaches to outlet of airslide cars

Sprout, Waldron & Co., Muncy, Pa. —Portable, pneumatic unloader attaches to the outlet of airslide cars and will convey most materials that can be handled in an airslide car, as clay, urea, phenolic molding compounds and synthetic resins. Three and four inch diameter conveying lines and units are delivering capacities in excess of 17 tons per hour.

For More Details Circle No. 408—Page 203

Carbon Raiser

is used to control the carbon content of steel heats

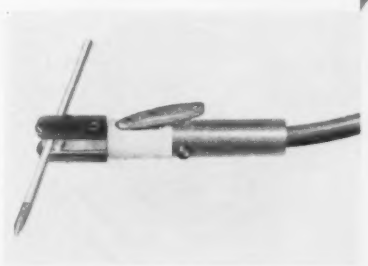
Becker Bros. Carbon Co., Dept. F, 3450 South Laramie Ave., Chicago 50, Ill.—A blend of artificial graphite, known as Carborise, is made for use by the steel industry in controlling the carbon content of steel heats. The additive is claimed to be made under strict quality standards and constantly checked for proper mesh size, purity and uniformity. Mesh sizes run from fine to coarse to meet requirements.

For More Details Circle No. 409—Page 203

Cutting Torch

is short and compact to permit ease of operation

Arcair Co., 419 South Mt. Pleasant St., Lancaster, O.—Model H-3 cutting and gouging torch is short and compact to permit ease of operation, especially in hard-to-get-at places. Among its features are heat and impact resistant molded plastic insulators, pushbutton air valve that is insulated and does not need to be held



down, cable connection inside handle and an insulating rubber boot on the connection to welding lead. The torch uses an electric arc and compressed air and cuts, gouges, grooves or bevels any metal.

For More Details Circle No. 410—Page 203

Entrainment Separator

removes liquid particles from air and other gases

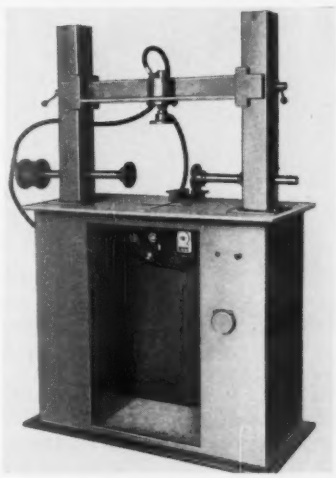
National Carbon Co., Division of Union Carbide & Carbon Corp., 30 East 42nd St., New York 17, N. Y.—Corrosion-resistant entrainment separator for the removal of liquid particles from air and other gases is

CO_2 Gassing Apparatus Speeds Hardening

AUTOMATIC core clamping and gassing apparatus for use with CO_2 hardens cores in three seconds and reportedly cuts gas costs up to 90 per cent of that required by former methods. The apparatus will accommodate corebox up to 20 in. high and 22 in. wide. It is equipped with two movable clamps and one stationary clamp which allow cores to be gassed from the top or either side.

The gasser can be operated manually through a pushbutton or automatically by a limit switch that is tripped by the corebox being gassed. When the limit switch is tripped, the gassing cycle starts and the core is gassed and hardened in three seconds. After the gassing cycle is completed, an automatic timer releases the two movable clamps and the machine is ready for the next corebox.

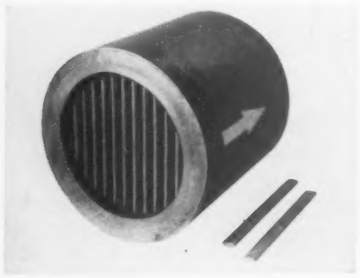
The machine is equipped with two extra heavy duty solenoids and a 0 to 60 second timer. The gassing table is vented and therefore it is not necessary to use a vent plate. The machine is manufactured by Carver Foundry Products Co., 1056 Hershey Ave., Muscatine, Iowa.



For More Details Circle No. 442—Page 203

made of impervious graphite rods, streamlined in cross section, and staggered in rows within a cylinder. Minimum clearance is ¼ in., which prevents clogging. As the gas to be scrubbed flows through the cylinder, moisture particles impinge on the separator rods and the gas flows on through. Graphite materials in the scrubber are chemically inert to mineral acids, organic solvents, salt solutions and other corrosives. Unit can be operated at temperatures ranging from −40° to 340°F, and at pressures from a full vacuum to 65 psig. Four diameters are made—6, 8, 12 and 16 in. Length of each cylinder is 22 in. for installation between faces of 150-lb ASA flanges with no enlargement of the pipe line.

For More Details Circle No. 411—Page 203



High-Speed Duplicators

have application in pattern shops as well as machine shops

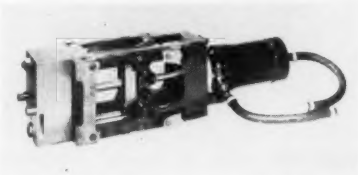
Tracer Control Co., 595 East Ten Mile Rd., Hazel Park, Mich.—Electronic-hydraulic tracer control machines are capable of tracing up to 100 in. per minute and have application in pattern shops for duplication of pattern and auxiliary equipment. Plane and depth control are accomplished with a single probe. Tracer control equipment can be supplied as original equipment on machine tools or be installed on existing machines in the field. Natural frequency of the machine tool, new or old, can be predetermined and tracer performance predicted prior to installation.

For More Details Circle No. 412—Page 203

Toggle Mechanism

is for use on DCMT high speed zinc die casting machines

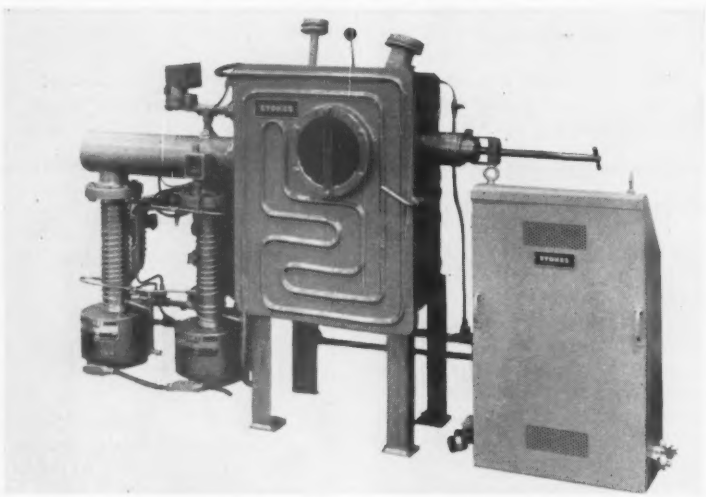
British Industries Corp., DCMT Division, Port Washington, N. Y.—Toggle mechanism for small, high-speed DCMT die casting machines is interchangeable with all existing zinc alloy units. Points of difference are more massive air cylinder, stronger and larger ejector box permitting ejection over the complete area of maximum size 9 x 9 in. die blocks, and heavier-duty toggle links



having oil holes for oiling all toggle pins. The unit is cored to make it light enough to be portable and to be able to be moved continuously at high speed. A foot on the toggle mechanism contacts an adjustable safety mechanism so that it is impossible for the machine to operate unless the dies are completely locked and toggles overthrown.

For More Details Circle No. 413—Page 203

Vacuum Furnaces Are for Precision Casting



VACUUM FURNACE designed for precision casting operations and suitable for "all-out" production is capable of melting and pouring single casts of 5 to 17 lb, under vacuums as low as 2 microns. The furnace, Model 437-520, is engineered for fast-cycle production of precision components for either investment or permanent mold methods by remelting high purity vacuum-melted or air-melted alloys.

Production cycles as short as 10 to 12 minutes are possible when vacuum-melted metal is used for the feed stock. Cycles are somewhat longer when air-melted stock is used which has to be degassed and undergo further purification under vacuum.

The furnace is 72 in. wide x 87 in. deep. It can be supplied with a choice of three different sizes or capacities of Inductotherm induction heating units, 20, 30 or 50 kw, to match particular job requirements and desired production rates. The furnace is made by the F. J. Stokes Corp., 5500 Tabor Rd., Philadelphia 20, Pa.

For More Details Circle No. 443—Page 203

Aluminum Oxide Abrasive

holds its form and remains sharp between wheel dressings

Norton Co., Worcester 6, Mass.—Abrasive produced by a special new electric furnace process is the latest addition to company's line of aluminum oxide abrasives. Primary benefits of the 44 Alundum abrasive, as it is called, are said to be greater toughness, higher inherent strength, finer crystal structure and greater sharpness. Its ability to hold form and remain sharp between dressings makes the 44 Alundum abrasive well suited to a variety of grinding applications, including snagging, in foundry operations, according to the manufacturer.

For More Details Circle No. 414—Page 203

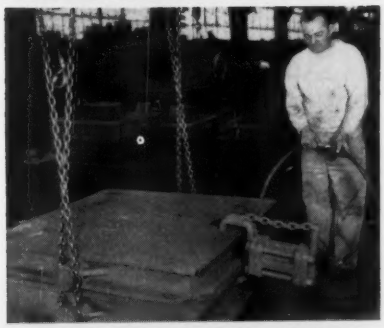
Fire Gun

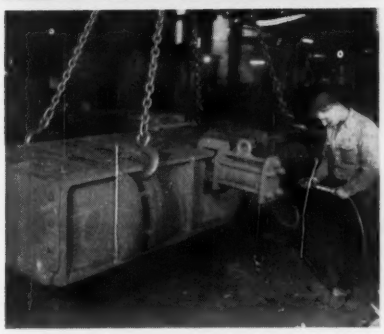
has built-in automatic safety pressure check

Hauck Mfg. Co., 124-136 Tenth St., Brooklyn 15, N. Y.—Fire-Gun oil-burning utility torch for heating, drying melting, thawing, burning and disinfecting now has an automatic safety pressure check built into it.

SHAKE-OUT VIBRATORS

for all foundry applications





Write for complete specifications and prices.

AIR OR ELECTRIC

PORTABLE OR PERMANENT

SILENT OR STANDARD

2788 Clinton Avenue • Cleveland 13, Ohio

Circle 683 on Inquiry Card—Page 201

When maximum operating air pressure has been pumped into the fuel tank, no additional pressure can enter. The portable, kerosene or oil-burning torch produces a powerful, smokeless, controlled 2000°F flame.

It can be furnished to burn gasoline. Two sizes are available — a 4-gal or 5-gal fuel tank, seamless steel coil burner, pressure gage and safety check, brass hand pump, 6-ft oil-resisting hose and snap-on web shoulder strap.

For More Details Circle No. 415—Page 203

Pocket Pyrometer

used for direct reading of temperatures up to 4300°F

Epic Inc., 154 Nassau St., New York 38, N. Y.—Pocket pyrometer is for direct reading of temperatures up to 4300°F. The instrument weighs five ounces, is 2½ in. in diam

and 6½ in. long. It is available in several ranges and can be provided in either centrigrade or fahrenheit scales. The pyrometer comes in a leather case and is provided with a protective red glass shade for the eye and a protective screen for the hand.

For More Details Circle No. 416—Page 203

Industrial Emergency Unit

is equipped to cope with most industrial plant disasters

Dana Corp., Toledo 1, O.—Mobile industrial emergency unit for plant disaster and civic defense programs

NOJOINT lasts 26 months

where other linings for LADLES average only 1 month's service

A SERVICE REPORT

from A. W. Varnon at Goslin-Birmingham Mfg. Co. proves the outstanding economy of *IRONTON* NOJOINT, the plastic refractory for all-around foundry use. In ladle No. 3, 12,000 lb. capacity, the NOJOINT lining lasted 26 months while handling 5200 tons of gray iron. In all that time, there was no patching or maintenance on the sides or bottom of the ladle.

IRONTON NOJOINT gives longer ladle life at rock-bottom cost for linings

Mr. Varnon put $30.00 worth of NOJOINT in the ladle, so his cost per ton of metal handled is $.0056. If that is the kind of economy you want, switch to *IRONTON* NOJOINT now.

Ironton will send a "MAN WHO KNOWS" to help your foundry men put in a NOJOINT lining. Call or write today.

THE IRONTON FIRE BRICK COMPANY
SINCE 1917
IRONTON, OHIO

1341 Ashtabula Street

Reliable Refractories

Write for name of nearest Ironton man, or telephone Ironton 109

Circle 684 on Inquiry Card—Page 201

can be transported by fork truck pickup or pushed on its own rubber-tired wheels to a disaster area. It measures 4 ft wide x 7 ft high x 8 ft long. Compartments occupying one

side and both ends of the unit hold a complete arrangement of emergency and disaster equipment as rubber coats, asbestos suits, helmets, boots, fire extinguishers, hand lights, first-aid kits, gloves, wrecking bars, axes, fire shovel, hose, ladder, wrenches, wire cutters, etc.

For More Details Circle No. 417—Page 203

Power Roof Exhausters

are available in capacity range of 300 to 6500 cfm

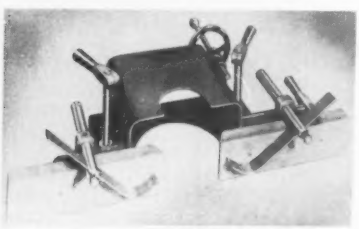
Greenheck Fan & Ventilator Corp., Schofield, Wis.—Centrifugal and axle type power roof exhausters in capacity range of 300 to 6500 cfm are available in a complete choice of sizes in both types. Construction is of spun aluminum with the motor cushioned in rubber to eliminate any vibrations.

For More Details Circle No. 418—Page 203

Woodworking Machine

channels shavings back and out without choking cutting speed

Boice-Crane Co., 907 West Central Ave., Toledo 6, O.—Woodworking machine device called the Shaving Shute, for use on company's spindle



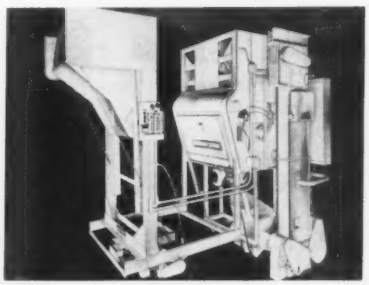
shaper, channels shavings back and out. The operator's vision is unclouded by flying shavings and they do not pack around the cutter so as to choke the cutting speed. Connections can be made to a unit type or plant-wide shavings and dust collector. The entire 27 in. fence as a unit, and each face independently, are adjustable forward and back. Hardwood faces are 2½ in. high, adjustable laterally to suit the cutter diameter.

For More Details Circle No. 419—Page 203

Airless Blast Cleaning

unit has an operating load capacity of 14 cu ft

Wheelabrator Corp., 1102 South Byrkit St., Mishawaka, Ind.—A new size Super Tumblast airless abrasive blast cleaning machine for cleaning sand, scale, oxides and other contaminants from metals has an operating load capacity of 14 cu ft. The unit throws 830 lb of abrasive per minute, or more than twice as much abrasive per minute as any similarly sized wheel previously used. The abrasive shower from the wheel



spreads over the cleaning chamber uniformly and provides fast cleaning. The machine's steel flight conveyor is sealed so tightly that there are no areas where work can jam and displace liners, interfere with the operation of the door or break the abrasive-tight seal on the machine.

For More Details Circle No. 420—Page 203

Handcutting Blowpipe

has the capacity to cut risers over 55 in. thick

Linde Air Products Co., Division of Carbide & Carbon Co., 30 East 42nd St., New York 17, N. Y.—Oxweld C-63 handcutting blowpipe features separate oxygen lines for preheat and cutting oxygen and is capable of cutting risers over 55 in. thick. Separate preheat oxygen line supply also provides stable preheat flames which are unaffected by operation of the

cutting oxygen valve. The C-63 is designed for use with medium-pressure acetylene. Cutting nozzles are available for use with other fuel gases. For special job requirements, the blowpipe is available with longer lengths of stainless steel tubing to increase its normal length of 4 ft 9 in.

For More Details Circle No. 421—Page 203

Aluminum Paint

can withstand temperatures up to 1700°F without blistering

Chem Industrial Co., 3784 Ridge Rd., Brooklyn 9, O.—Extra-high-heat aluminum paint is capable of withstanding temperatures up to 1700°F without blistering or burning, according to the manufacturer. The paint is composed of a clear silicone base with a special aluminum flake pig-

Water Used as Agent in Magnetic Inspection

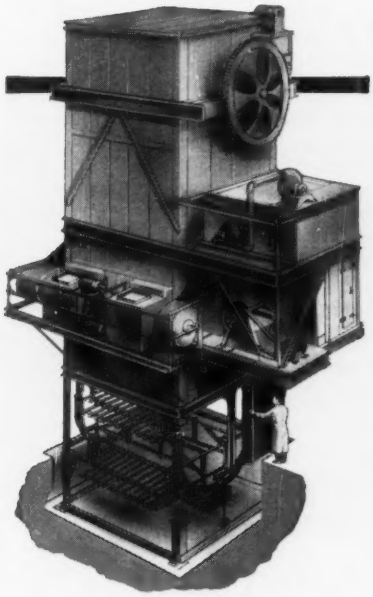
WATER SUSPENDIBLE Magnaflux and Magnaglo materials are for wet-method magnetic particle inspection techniques using water as the liquid agent. Four formulations are available: No. 27 Black, said to be equivalent to regular No. 7B Black in oil; No. 29 Red, said to be equivalent to No. 9B Red in oil; No. 12 Magnaglo, considerably less sensitive than regular No. 10 Magnaglo in oil and No. 24 Magnaglo which, at a suggested 2 oz/gal concentration is said to be the most sensitive wet-method magnetic particle inspection material available.

Oil-base No. 10 Magnaglo is available with additives to make it suspendible in water. If used properly, according to the manufacturer, this water bath is equivalent in performance to its oil counterpart.

The one claimed advantage that a water suspension does have is eliminating fire hazards. Cost, electrical shock, equipment, bath concentration, cleaning (before and after inspection), skin irritation, foaming, conversion costs to water from oil and fume factors all vary considerably with individual situations and the manufacturer suggests they be studied before present inspection procedures are changed from oil to water suspendible materials. The materials are made by the Magnaflux Corp., 7300 West Lawrence Ave., Chicago 31, Ill.

For More Details Circle No. 444—Page 203

HOW MUCH DOES A FOUNDRY OVEN COST?



We could tell you down to the penny what the conveyor core oven pictured above cost. But that wouldn't really be the answer you would want.

Because the real cost of any oven comes *after* it's been installed. *After* you find out how much fuel it consumes; how many rejects pile up; how much production you get. That's the answer!

And that's the answer you *will* get—before the oven is installed—when experienced MOCO engineers specifically design an oven for your application. It will be the most economical piece of equipment possible. Why not contact MOCO today?

SEND TODAY for this free brochure explaining MOCO Foundry Ovens and their operation.

FOUNDRY OVEN DIVISION
MICHIGAN OVEN COMPANY
419 BRAINARD
DETROIT 1, MICH.
MOCO

Circle 685 on Inquiry Card—Page 201

ment. This combination air dries to a bright finish in about 30 minutes. It can be applied by either brush or spray gun. The material is available in quart and gallon cans and 5-gallon pails.

For More Details Circle No. 422—Page 203

Sandblast Hood

is said to protect wearer under moderate blast conditions

Pulmosan Safety Equipment Corp., 644 Pacific St., Brooklyn 17, N. Y.—No. 30 sandblast hood reportedly protects wearer under moderate blasting conditions. The lightweight hood features an adjustable fibre head frame and a replaceable hammock assembly. It is available with a wire screen window or laminated glass with a wire screen shield.

For More Details Circle No. 423—Page 203

Slide Rule Computer

reportedly takes the mystery out of motor freight rates

Speed-O-Rate Computer Sales Co., 914 Marquette Ave., Minneapolis 2, Minn. — Simplified computer which resembles a slide rule has been developed to take the mystery out of motor freight rates. It shows at a glance the cost of shipping freight to a given destination and consists of a semipermanent holder with apertures on each side and an insert card on which are printed the freight rate base numbers between various cities and the actual freight rates for various freight classifications. The minimum charge per shipment, as well as any surcharges, is noted on the card also.

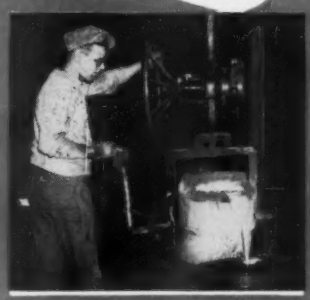
For More Details Circle No. 424—Page 203

Constant Voltage Welders

permit good control over a wide range of applications

Harnischfeger Corp., Welding Division, Milwaukee 1, Wis.—Modified constant voltage welders are 300, 500, 750 and 1200-amp machines. Main feature of the units is an adjustable

Not a speck of slag or metal sticks to linings of IRONTON BERLITE



FILLED 974 TIMES, a 1200-pound ladle handled 670 tons of metal before the lining of *IRONTON* BERLITE was replaced. The iron was poured at 2850° F. in a foundry making automotive housings.

Clean Ladles are a profit factor . . . protecting quality of castings, reducing scrap, saving labor. It pays to use *IRONTON* BERLITE in hand, bull and mixing ladles . . . because BERLITE does not shrink or expand, resists slag and metal erosion, has a higher P.C.E. than any fire clay material. Ask an Ironton "MAN WHO KNOWS" how you can put BERLITE to work throughout your foundry.

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Circle 686 on Inquiry Card—Page 201

America's Outstanding Grinders!

Maximum performance . . . production . . . economy . . . quality . . . speed . . . with minimum cost of operation and maintenance

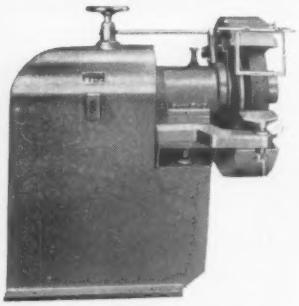
UNITED STATES ELECTRICAL TOOL COMPANY GRINDERS for every purpose . . . for every industry

SUPERB EXAMPLES OF THE TOOLMAKERS' CRAFT

60 years of skill and experience are embodied in every United States Electrical Tool—resulting in utmost efficiency and assured satisfaction.

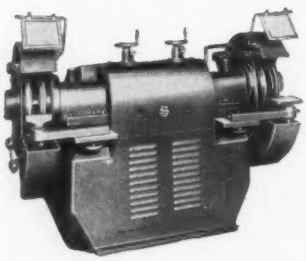
All rotating parts and spindles are precision-balanced dynamically by

• THE LATEST ELECTRONIC BALANCING EQUIPMENT



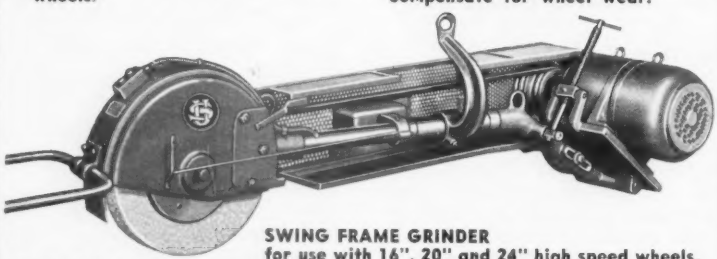
SINGLE END VARI-SPEED SNAGGING GRINDER
7½ to 40 HP MODEL 61 VS

Ideal stub user. Constant peripheral speed regardless of wheel diameter for increased production and longer wheel life. For vitrified or high speed grinding wheels.



DUAL MOTOR VARI-SPEED SNAGGING GRINDER
7½ to 40 HP MODEL 62 VS

For vitrified or high speed grinding wheels. Each wheel operates independently. Built to maintain constant wheel periphery and to compensate for wheel wear.



SWING FRAME GRINDER
for use with 16", 20" and 24" high speed wheels.

Perfect balance laterally and rotatively for easy handling; perfect visibility due to absence of outboard bearings; fabricated boiler plate steel guards; ball-bearing, fan-cooled, totally enclosed motor; single suspension at center, double suspension at wheel head and motor end; angular adjustment and many other features.

GENERAL PURPOSE FLOOR GRINDER MODEL 500

Totally enclosed motor, 1 to 5 hp; push button starting with overload protection; ball - bearings enclosed in dust-tight housings; enclosed adjustable wheel guards; tool tray and lift-out water pot; ball-bearing.

WRITE TODAY FOR CATALOGS OF PORTABLE ELECTRIC TOOLS, GRINDERS, BUFFERS, ETC.

THE UNITED STATES ELECTRICAL TOOL COMPANY
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slope control that gives a soft arc, eliminates burn-back and stubbing, and provides a stable, spray-type deposit when adjusted properly for aluminum, stainless steel and other al-

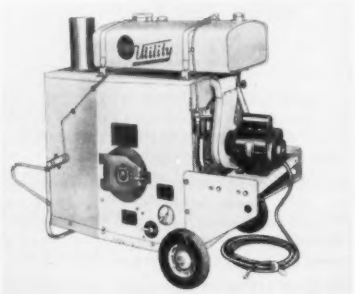
loys. Claimed advantages are simplified operation, lower installation and power costs and x-ray welds for inert gas, submerged arc, semiautomatic and all-metallic arc welding processes.

For More Details Circle No. 425—Page 203

Portable Space Heaters

contain new safety features and simplified controls

American Air Filter Co., 215 Central Ave., Louisville 8, Ky.—Line of portable space heaters includes oil and gasoline-fired units in capacities from 50,000 to 450,000 Btu per hr. A "Thrifty" model is powered with



a 1/3-hp electric motor. A "Utility" model features optional power plants, interchangeable between gasoline engine and electric motor. A "Deluxe" model is an all-automatic unit with optional, remote temperature control.

For More Details Circle No. 426—Page 203

Flow Measuring Instruments

are individually calibrated to meet specific flow conditions

Selas Corp. of America, Dresher, Pa.—Flo-Scope, an instrument for measuring flow rates of air and gases, can handle up to 75,000 cu ft of air per hr. Known as Series F,

NOW...

a Skimmer that really **SKIMS!** from Spincraft

SKILL WILL DO IT

Skimmers and Ladles available in STAINLESS STEEL and MILD STEEL

In answer to continued requests from hundreds of its ladle customers, Spincraft has added a line of truly superior skimmers. Designed after extensive research, Spincraft Skimmers meet die casters' skimming requirements. The shallow radius "skims" instead of "ladles" as deep-cupped skimmers do. Correct size perforations prevent clogging. Handle stub fits common pipe—attach a handle of exactly the type and length you want. Diameters: 6", 8", 10" and 12".

SPINCRAFT LADLES

for non-ferrous metal pouring

Light, tough, long-lasting — designed to reduce operator fatigue, minimize spillage and improve heat transfer. In 23 sizes, from ¼ lb. to 30 lbs.—with or without handles. A die-casting *must*.

Write for complete data and prices on ladles *and* skimmers TODAY.

Spincraft
SKILL WILL DO IT
INCORPORATED

4138 W. State St., Milwaukee, Wis.

Circle 688 on Inquiry Card—Page 201

the Flo-Scope reportedly incorporates design changes which reduce installation costs by permitting one-man panel mounting and reduce maintenance costs by simplifying cleaning procedures. Each unit is individually calibrated at customer's specified flow conditions. The instruments are useful for measuring flow rates of air and gases, separately or in mixtures, for combustion in furnaces and ovens.

For More Details Circle No. 427—Page 203

Heavy-Duty Vacuum

utilizes metal drums to hold wet or dry material

American Cleaning Equipment Corp,. 2029 South Halsted St., Chicago 8, Ill. — Heavy-duty vacuum cleaning machine uses metal drums to hold wet or dry material. Any number of drums can be used, and

the change from one to another takes only a few seconds. For sump cleaning or flood control, the original drum is equipped with a dump valve to ease emptying. Filter bag can be cleaned while machine is running. Automatic water shut-off cuts off suction when liquid reaches proper height. Three motor sizes are available — 1¼, 2 or 3 hp. Motors can be explosion-proof for hazardous jobs.

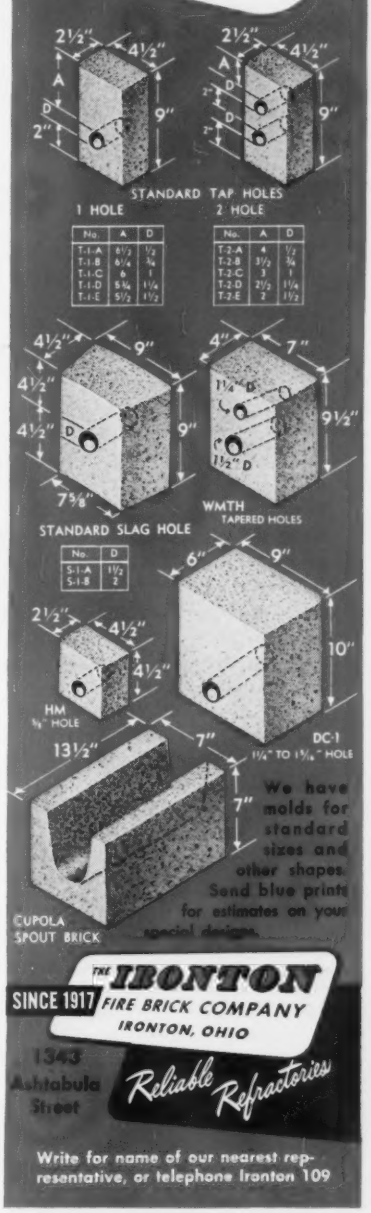
For More Details Circle No. 428—Page 203

Pourable Cement

is reputed to set anchor bolts in 10 minutes or less

Monroe Co., 10703 Quebec Ave., Cleveland 6, O.—Pourable cement is reputed to set anchor bolts in 10 minutes or less. Known as Evr-tite, the light gray powder mixes readily with water to form a semifluid, pourable compound. When applied around an anchor bolt, it attaches itself to the bolt surface and fills all sections of the hole. Anchor bolts can be drawn tight and light equipment put into operation within 30 minutes after application of the cement. For

STEP UP PRODUCTION with IRONTON TIME-SAVING SPECIALTIES for CUPOLAS



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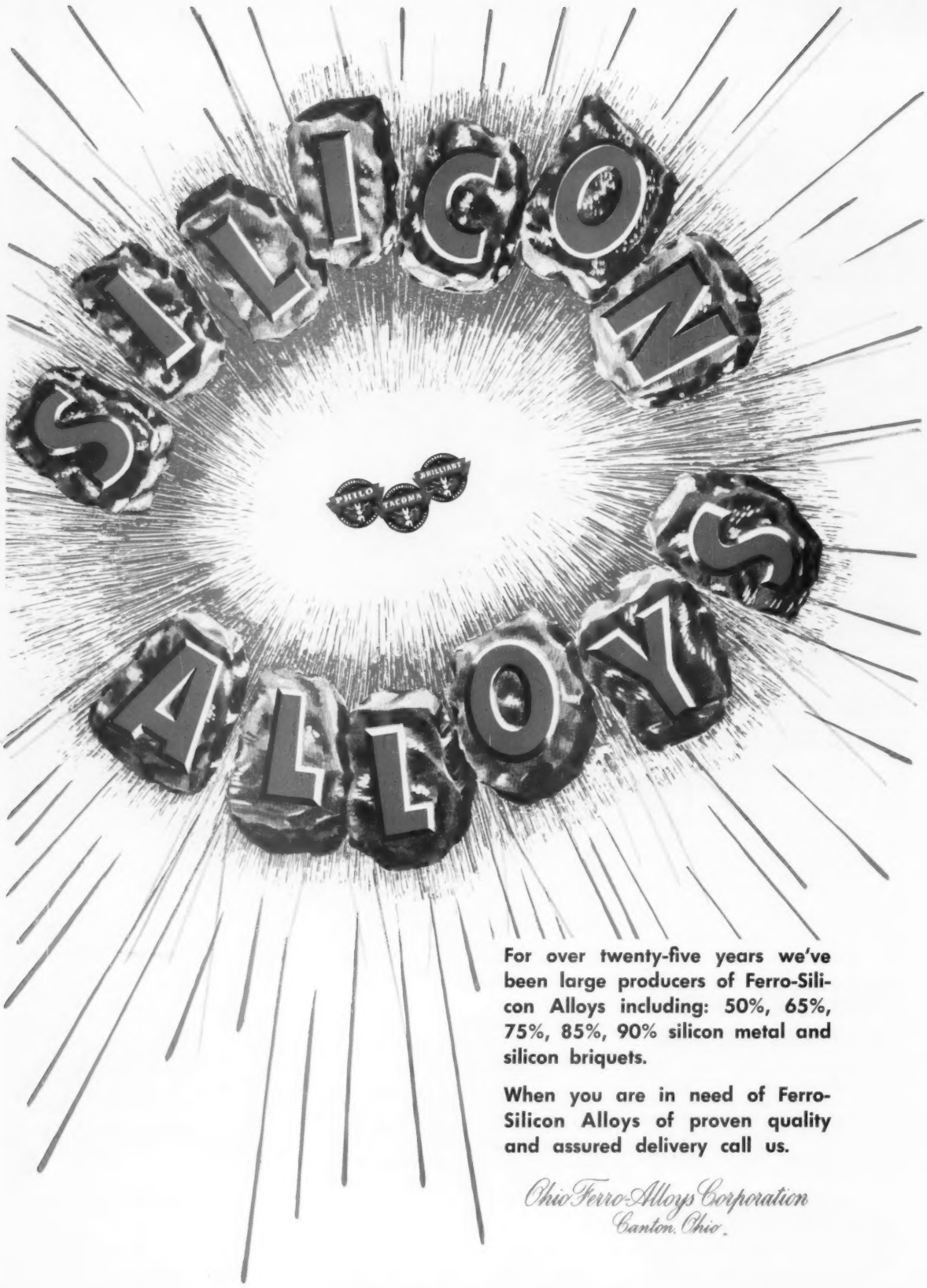
Circle 689 on Inquiry Card—Page 201



For over twenty-five years we've been large producers of Ferro-Silicon Alloys including: 50%, 65%, 75%, 85%, 90% silicon metal and silicon briquets.

When you are in need of Ferro-Silicon Alloys of proven quality and assured delivery call us.

Ohio Ferro-Alloys Corporation
Canton, Ohio

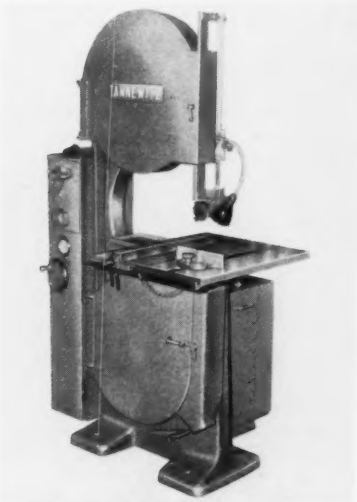
heavy vibrating machinery, Evr-tite reportedly achieves high impact strength in less than one hour.

For More Details Circle No. 429—Page 203

Variable-Speed Band Saw

can operate at any speed from 300 to 6000 rpm

Tannewitz Works, Grand Rapids, Mich.—Variable-speed band saw has 24-in.-diam wheels and can be operated at any speed from 300 to 6000 rpm. The saw reportedly can be



adapted to any kind of sawing, whether wood or metal. Table is 24 x 28 in. and may be tilted and locked at any angle from 15 degrees left to 45 degrees right. Saw is motor driven and equipped with pushbutton controls and overload and low voltage protection.

For More Details Circle No. 430—Page 203

Motor Generators

are for a variety of induction heat treating applications

Welduction Corp., 10230 Capital Ave., Oak Park 37, Mich.—High frequency, vertical motor generators are for induction heat treating applications such as melting, brazing, annealing and hardening. Generator ratings from 10 to 250 kw outputs are available in frequencies of 1000, 3000 and 10,000 cycles per second. Higher kilowatt rated generators and other frequencies can be supplied.

For More Details Circle No. 431—Page 203

Hardening Compound

is applied to tools or steel parts as a hardening agent

Armor-Tuf Sales Corp., 299 Madison Ave., New York, N. Y.—Steel hardening compound is applied to tools or steel parts as part of a sim-

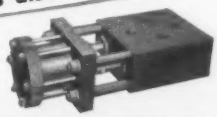
INEXPENSIVE—HIGHLY EFFICIENT

UNEQUALED FOR ⅛" AND ¼" SERVICE

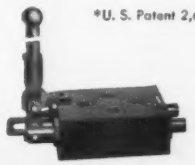
• These valves combine utmost simplicity, low price and rugged, efficient, dependable construction. Valve chambers* are formed by aluminum spacers held tightly in metal to metal end abutment assuring accurate positioning of the "O" rings on both inside and outside diameters without mechanical pressure. The flow is from the inlet chamber through the hollow radially ported ground and polished stainless steel plunger, and out through other ports in the plunger to the connected line. No direct impingement of flow across the packings. No lapped joints. No metal to metal seating. Sub-base permits ⅛" or ¼" pipe connections into either side or bottom. Easily serviced in the field. Write for fully descriptive bulletin.

*U. S. Patent 2,645,450

Ask us also about . . .

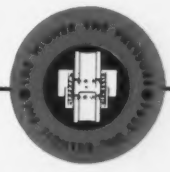


PILOT CYLINDER OPERATED HYDRAULIC VALVES suited for use with water or hydraulic oils up to 5,000 psi. 2-way, 3-way and 4-way actions. Sizes ½" through 4".



LEVER OPERATED HYDRAULIC VALVES suited for use with water or hydraulic oils up to 5,000 psi. 2-way, 3-way and 4-way actions. Sizes ½" through 1½".

Quick-As-Wink®
AIR AND HYDRAULIC
Control Valves



Hand, Foot, Cam, Pilot, Diaphragm and Solenoid Operated

Mfd. by C. B. HUNT & SON, INC., 1974 East Pershing St., Salem, Ohio

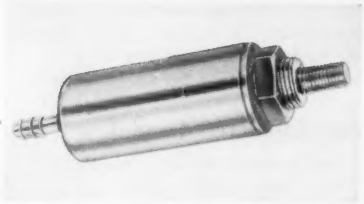
plified heat treating and hardening process. Compound is applied to part to be treated, allowed to dry before being placed in a furnace at 1450 to 1600° F and hardened. It is possible to attain a 60 Rockwell C hardness in a few minutes, according to the manufacturer. If a deeper case is desired, the piece is kept in the furnace for 30 minutes or more. A depth of 1/32 in. can be obtained in 1 hour. No cyanide is used and all toxic or obnoxious fumes are eliminated by this method.

For More Details Circle No. 432—Page 203

Air Cylinder

can be used for clamping, moving, holding and ejecting

Bimba Hardware & Mfg. Co., 101 Main St., Monee, Ill.—Single-acting spring return air cylinder can be used for clamping, moving, holding, ejecting, pushing or other applications. In operation, a vinyl cup mounted in an aluminum alloy piston slides within a stainless steel body to which an air hose adapter is fastened. The front or open end of the body is fastened over the piston rod guide to make a permanent connection. The cylinder will exert a force equal to 0.9 of the air line pressure for a maximum stroke of 1 in. A lock nut on the front nose secures the cylinder to the mount.



For More Details Circle No. 433—Page 203

DEPENDABLE TEMPERATURE
CONTROL
Check your molten metal temperatures often with Marshall Enclosed-Tip Thermocouples to insure real temperature control. This will assure pouring neither too hot nor too cold, but at just the right heat.
Thus Marshall Thermocouples will aid you to produce sound, dense castings. They will help to eliminate casting flaws, such as misruns, pinholes, excessive shrinkage — cut costs and increase output.
Couple wires in these instruments are swaged into the tip, and insulated from contact throughout the tube. Readings are instant and exact.
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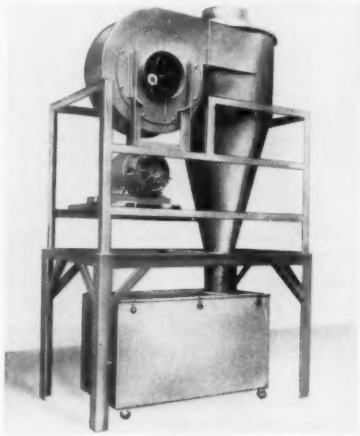
Marshall
THERMOCOUPLES

Dust Collector

is for use where large volumes of dust or residue accumulate

Aget Mfg. Co., Adrian, Mich.—Dust collector, 90 NB 50, is designed for use in grinding, buffing, woodworking and miscellaneous operations where a large volume of dust, chips, shavings and other residue accumulates from manufacturing processes. Unit has a roll-away dust collecting bin with a capacity of 37½ cu ft that moves on rubber-tired ball bearing casters. Collector has an air handling capacity of about 10,000 cfm and uses a 15 hp motor. Fan inlet will take 15 in. pipe. Overall dimensions are 48 in. deep x 82 in. wide x 124 in. high.



For More Details Circle No. 434—Page 203

Indirect Arc Furnaces

feature automatically controlled motor-driven electrodes

Detroit Electric Furnace Division, Kuhlman Electric Co., Bay City, Mich.—Indirect arc furnaces are pedestal mounted with a new arc control system and motor driven electrodes that are controlled automatically. The arc control, of the magnetic amplifier type, permits varia-

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The International Line is designed by experienced foundry engineers who have a practical working knowledge of the problems of the industry.

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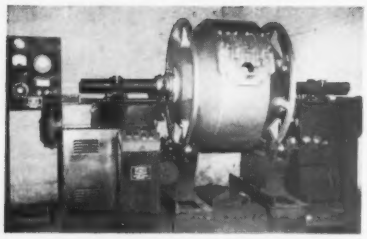


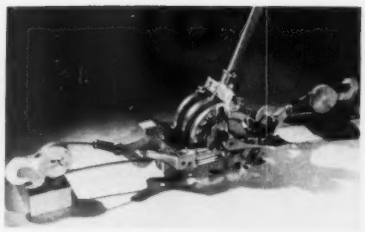
tion in the speed of the control motor so that its speed is directly proportioned to unbalance. Electrodes may be moved by manual pushbutton controls while recharging or for electrode positioning during automatic operation. Capacities of the rocking type furnaces, designated the P series, are from 350 to 4000 lb with kw ratings from 125 to 600.

For More Details Circle No. 435—Page 203

Universal Power Tool

has application for lifting, lowering and pulling

Multiple Corp., 1908 North Main St., Dayton 5, O.—Universal power tool with brakes weighs 29 lb and



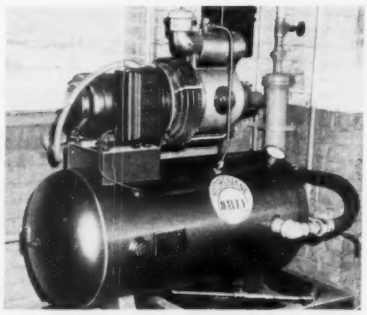
Model T-100, twin unit, has a single cable capacity of 7000 lb, 14,000 lb with sheave. Manufacturer reports the tool has applications for lifting, lowering and pulling wherever light or heavy equipment is used. A single model S-100 that weighs 21 lb also is available.

For More Details Circle No. 436—Page 203

Rotary Compressor

is available with either horizontal or vertical air tanks

Davey Compressor Co., Kent, O.—A 5-hp, tank-mounted rotary compressor, the Davey Hydrovane has a displacement of 21 cfm and is available with modulation, start-stop or combination modulation-stop-start



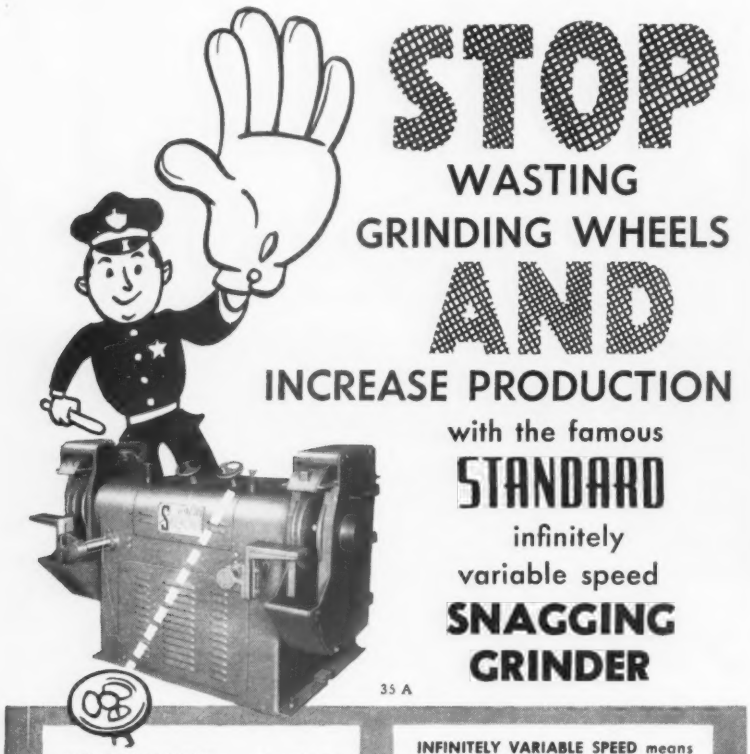
control. Maximum working pressure is 200 psi for continuous operation. For intermittent use, compressors may be operated at 250 psi. Units are available with either horizontal or vertical air tanks. Over-all dimensions of the horizontal tank model are 25 in. wide x 48 in. long x 44⅜ in. high. Vertical tank unit is 25 in. wide x 35¼ in. long x 72½ in. high. Weight is 400 lb.

For More Details Circle No. 437—Page 203

Temperature Controller

keeps temperatures from rising or falling past preset points

Tipp Mfg. Co., Tipp City, O.—Automatic monitoring and accurate control of temperatures from —200 to 3000°F, in a broad variety of industrial and research applications, are provided by the Tipp-Tron controller. Depending on the model, the Tipp-Tron prevents temperature of equipment and processes from rising or



TURN HAND WHEEL—automatically adjusts guard, increases spindle speed in relation to worn wheel—you get FULL WHEEL WEAR DOWN TO FLANGES! Foundries report as much as 100% increase in wheel life.

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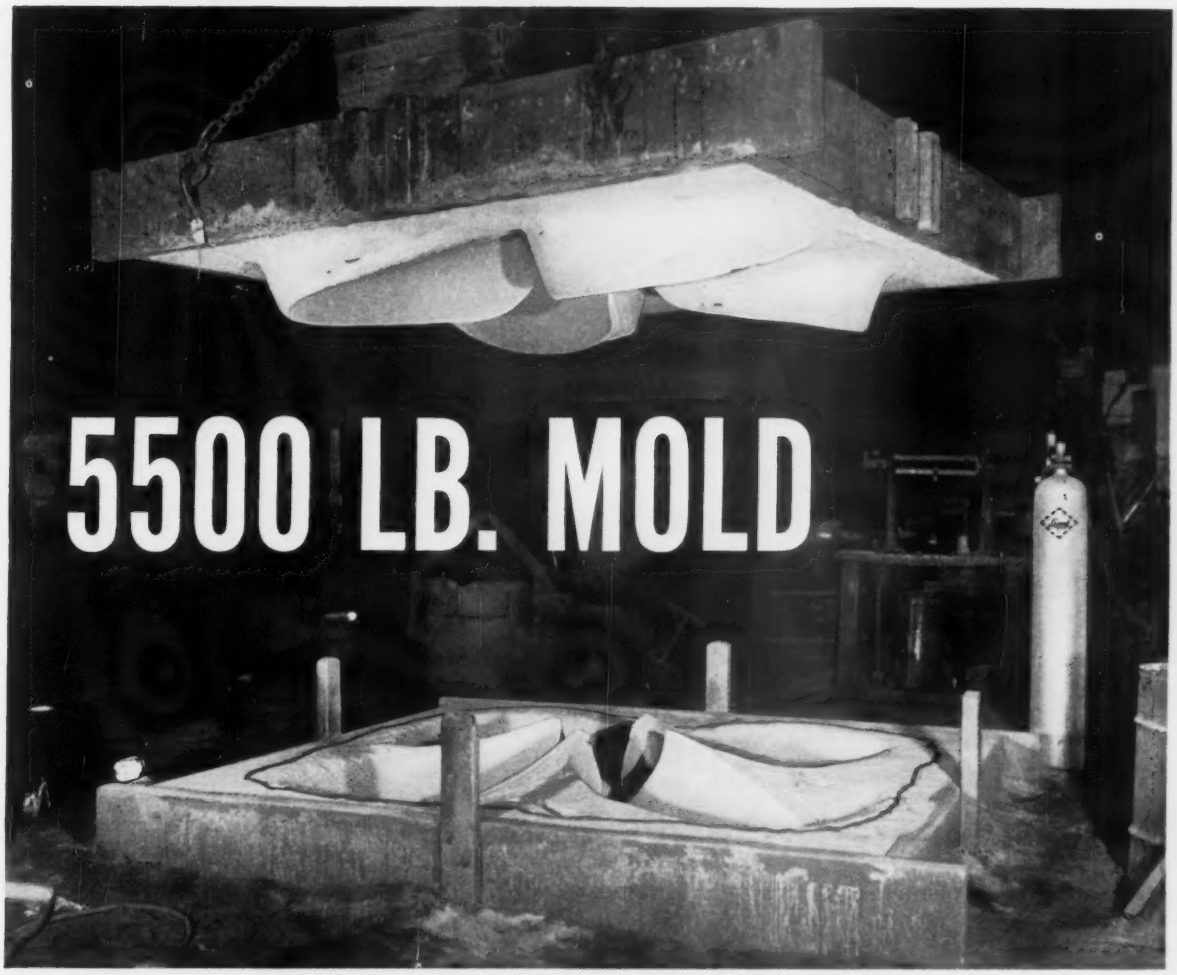

IN 40 MINUTES!

Fast, bakeless hardening of molds for large castings—like this one for 3400 pound nickel aluminum bronze propellers—is standard procedure at Columbian Bronze Corporation, Brooklyn, New York.

In addition to tremendous savings in time, Columbian Bronze reports these added advantages from CO_2 curing. no baking required • far fewer gaggers needed • elimination of need for extreme skill necessary in green sand molding • no danger of drops, soft spots or wet spots in mold • molds may be left for several days before pouring.

For complete facts and technical data on how CO_2 mold curing will revolutionize your operation, contact

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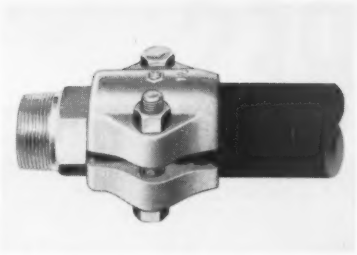
falling past preset points. The standard controller is supplied in single or multimeter models, with the latter providing control for virtually any number of individual temperature control points. Custom models also can be engineered.

For More Details Circle No. 438—Page 203

Clamp-Type Hose End

can be used in high pressure lines for air, fluids and steam



Weatherhead Co., Fort Wayne Division, Fort Wayne, Ind.—Clamp-type hose end which couples readily on other types of hose is said to provide maximum versatility in high-pressure lines for air, hydraulic fluids and steam. It requires no hose skiving or special tools and may be used repeatedly. Made of malleable iron, the hose end is supplied in ¼, ⅜, ½, ¾, 1, 1¼, 1½ and 2-in. sizes.

For More Details Circle No. 439—Page 203

Jib Cranes

are power rotated and have lifting capacities to 15 tons

R. G. LeTourneau Inc., 2399 South MacArthur, Longview, Tex.—Power-rotated jib cranes are available in capacities of 6, 7½, 10 and 15 tons. Each crane has a 25-ft boom which, when rotated in a full circle, covers 1965 sq ft of floor space. Cranes are

used where one-man handling is desired of such items as castings, ingots, pattern molds, machine tools, slabs or other loads within the 30,000-lb class. Heavy-duty electromechanical motor brakes, plus built-in regenerative electric braking action are said to provide absolute control of both boom and load.

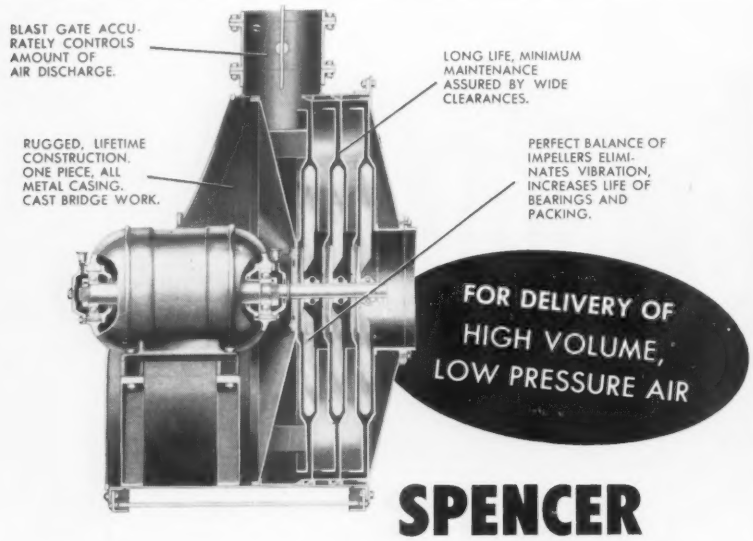
For More Details Circle No. 440—Page 203

Constant Level Oiler

maintains oil in bearing reservoir at a constant level

Oil-Rite Corp., 2387 Waldo Blvd., Manitowoc, Wis. — Constant level oilers reportedly will maintain automatically the oil in a bearing reservoir at a constant level. Units can be used on ring oiled and antifriction bearings, gear boxes, pump housings and moistening pads. Operation is based on the liquid seal principle. Transparent reservoirs permit a visual check of the oil supply at all times and since the oil in the reservoir will assume the same color as that of the bearing housing it affords a visual check on the condition of the oil.

For More Details Circle No. 441—Page 203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LONG LIFE, MINIMUM MAINTENANCE ASSURED BY WIDE CLEARANCES.
RUGGED, LIFETIME CONSTRUCTION. ONE PIECE, ALL METAL CASING. CAST BRIDGE WORK.
PERFECT BALANCE OF IMPELLERS ELIMINATES VIBRATION, INCREASES LIFE OF BEARINGS AND PACKING.
FOR DELIVERY OF HIGH VOLUME, LOW PRESSURE AIR

SPENCER

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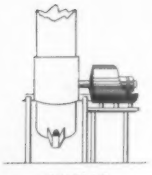

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You'll see Spencer "blowers" . . . with the familiar "sugar-scoop" design . . . on a wide variety of equipment in foundries and metal-working plants everywhere.

Performance is the reason. Experienced metals men know you *just can't beat* the rugged reliability, the proved-in-use performance of a Spencer Turbo.

Simple, built-to-last construction . . . mounting that requires no special foundation, no bolting down . . . discharge in any of eight positions . . . quiet operation . . . use of power proportional to amount of air used . . . these are a few of the reasons why *SPENCER is preferred.*

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Induction heating melting

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Mixing metals can present some awesome complications.

Dispersing lightweight aluminum through a nickel-cobalt solution, for example. Or recovering every grain of gold from a minting operation. Or salvaging the valuable chromium trapped in stainless steel scrap.

Surprisingly enough, all three of these problems are related. For they share a common solution . . . the unique features of an Ajax-Northrup induction furnace. This furnace "stirs" its molten charge, dispersing every element evenly through the melt regardless of density . . . combines fast melting with extremely accurate temperature control . . . prevents contamination . . . makes 100% scrap recovery an everyday reality.

That's why so many important alloys owe their very existence to Ajax induction furnaces. That's why, whether the charge is a new super alloy . . . bronze . . . or even gold . . . if the results are important, the furnace is Ajax-Northrup.

The fascinating history of induction heating and its unique application to melting, forging, and heating operations throughout industry are told in a new book. Write Ajax Electrothermic Corporation, Trenton 5, New Jersey for your copy.

Precision alloying is just one of the many processes which owe their existence to Ajax-Northrup induction heating.

ASSOCIATED COMPANIES: AJAX ELECTRIC COMPANY—AJAX ENGINEERING CORPORATION

Above—Operator is loading annealed cast brake drums in spinner hanger airless blast cleaner. Right—Closeup of a loaded hanger

AUTOMATIC CLEANING UNIT

Adapted to Job Shop Use

By EUGENE F. ANDERSON
Wheelabrator Corp., Mishawaka, Ind.

AUTOMATIC cleaning equipment in small and medium-sized jobbing foundries has been instrumental for some time in holding down operating costs. To do an even better job for these foundries, however, automatic equipment has been designed for them which is capable of much higher cleaning rates on large castings. This faster cleaning makes possible greater economy.

High-production equipment for larger castings has been available in the past, but frequently required a higher investment than the production of a medium plant permitted.

Benton Harbor Malleable Industries Inc., Benton Harbor, Mich., uses equipment of the newer design. It produces 800 to 900 tons of castings per month for trailers, lift trucks and other mobile material handling equipment. Although these castings are of a wide variety of sizes, shapes and weights, the whole production is handled by two automatic airless abrasive blast cleaning units. Castings are cleaned only once—after the annealing operation has been finished—rather than in both the green and the blue stages.

Castings at this plant are, for purposes of cleaning, considered in two categories. Smaller, more compact castings are handled by a standard model, tumble-blast-type airless blast cleaner with 17½-cu-ft capacity. The blast chamber is formed by an endless apron-type conveyor. It tumbles the castings under the blast of steel shot abrasive thrown from a rotating wheel overhead, and the tumbling action exposes all surfaces to the cleaning action of the blast.

The new type of machine now is used, however, for medium to large castings, plus those with shapes which make a tumbling action in conjunction with the blast inadvisable. It has the versatility to handle many kinds of work. Built on the order of a merry-go-round, it consists of four compartments arranged radially and mounted on a spider. In each compartment, a spinning-hanger fixture on the spider holds the work.

As the machine operates, the spider revolves, moving forward 90 degrees at each cycle, then stopping for a period. Each of these cycles draws one compartment with its hookful of work into the blast zone vestibule and one compartment out of it. When the spider stops, one of the four compartments is in the blast zone, where steel shot abrasive is centrifugally

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There is an A. P. Green product designed to meet industry's requirements for almost any type of service. You'll find that it pays to standardize on A. P. Green quality products.

For specific recommendations on your refractory problems, get in touch with your local A. P. Green distributor. He is listed in the yellow pages of your phone directory.

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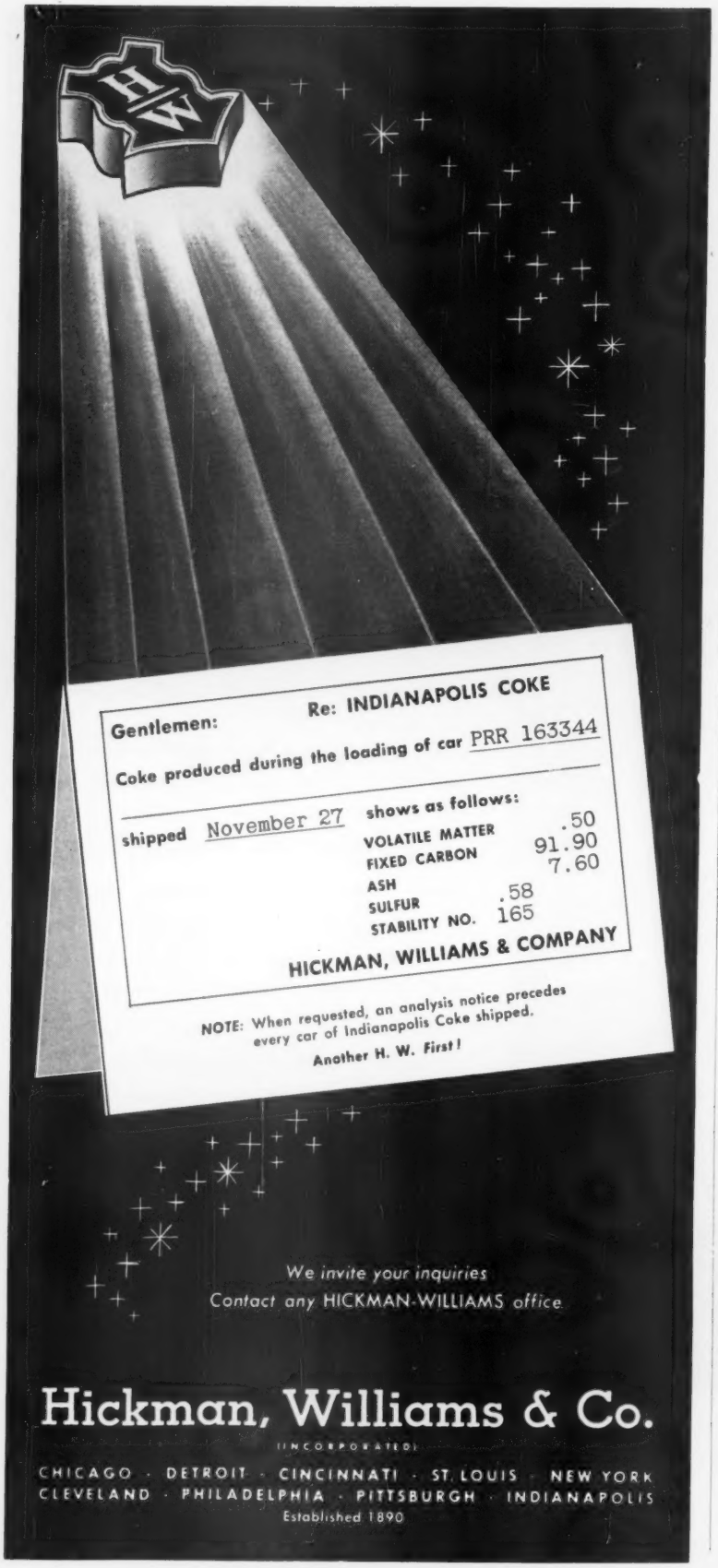
Gentlemen:
Re: INDIANAPOLIS COKE
Coke produced during the loading of car PRR 163344
shipped November 27
shows as follows:
VOLATILE MATTER .50
FIXED CARBON 91.90
ASH 7.60
SULFUR .58
STABILITY NO. 165
HICKMAN, WILLIAMS & COMPANY
NOTE: When requested, an analysis notice precedes every car of Indianapolis Coke shipped.
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Established 1890

hurled against the work for 216 seconds.

As in the other machine, abrasive is thrown by rotating, bladed wheels in the cabinet walls. Wheelabrator Corp., Mishawaka, Ind., manufacturer of the machine, designed it to incorporate two of these wheels in view of the speed of cleaning required and the nature of the work. A timer stops the blast after 216 seconds until the spider has advanced again. The advancement cycle takes 5 seconds.

While the spider is stopped, one compartment at the front of the machine is exposed for unloading and loading. An operator takes the clean castings off the hooks, loads fresh ones and actuates the spider by pushbutton.

The quantity of work carried on a hook depends on the size, shape and weight of the pieces being run. Various kinds of hooks are used which carry from two to more than a dozen pieces at once. Hundreds of different patterns therefore can be accommodated.

Brake drum castings weighing 38 lb each, for instance, are blasted in groups of six. If this part were run steadily in the machine, its production would be at the rate of 1.86 tons per hour.

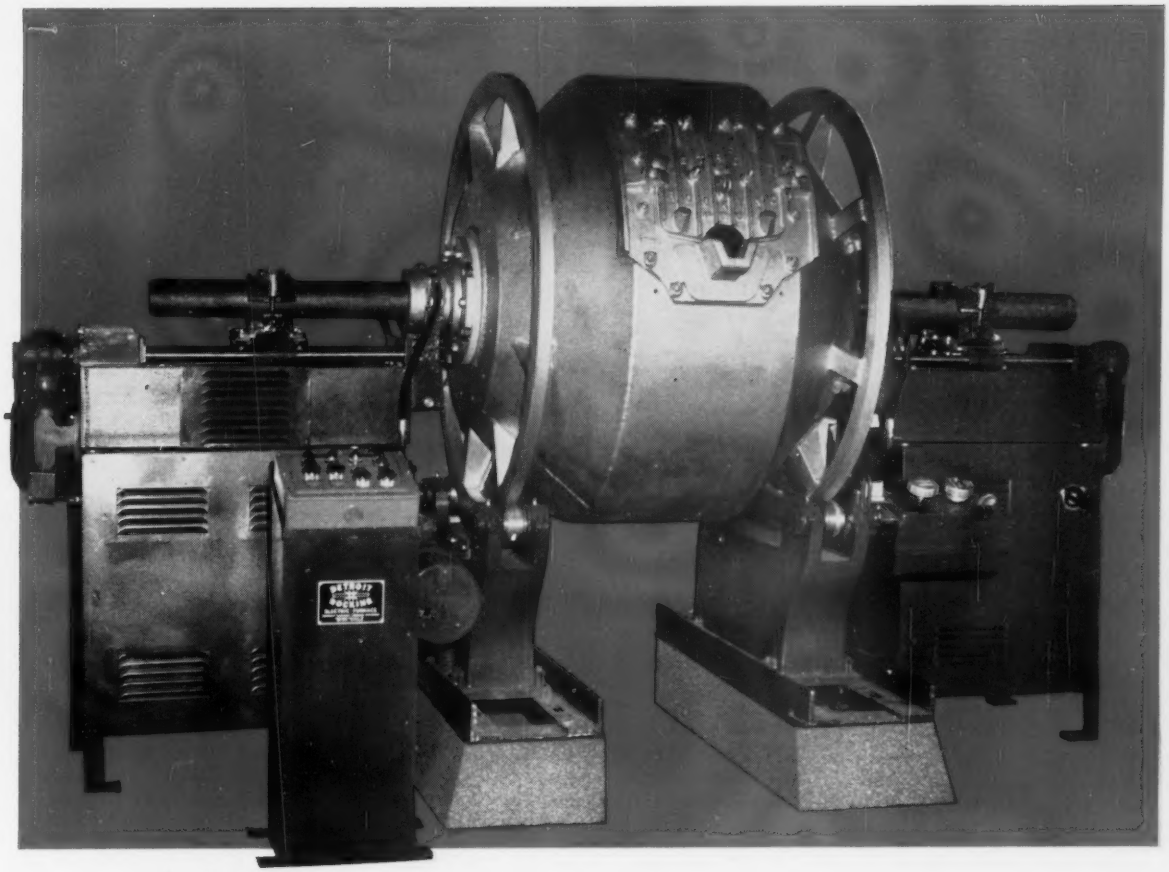
Another piece is a 170-lb wheel casting for a lift truck. These parts are put through the machine in groups of two. Blast time of 216 seconds per pair and compartment advancement time of 5 seconds would make possible a cleaning production of 2.8 tons per hour if this part were run steadily. The machine is 11 ft square by 8 ft above floor level.

Record-Size Exhibit Seen for Western Metal Exposition

The tenth Western Metal Exposition, Mar. 25-29 in Los Angeles is expected to fill Pan-Pacific Auditorium and three huge canvas pavilions, and will be the largest of these exhibits to date.

The tenth Western Metal Congress on the same dates in Los Angeles' Ambassador hotel will include technical sessions by American Society for Metals, Los Angeles Section of American Welding Society, Society for Non-Destructive Testing and American Institute of Mining and Metallurgical Engineers.

A titanium conference, like the first one given at university level two years ago in co-operation with New York University but of greater scope, also will be sponsored by ASM's Metals Engineering Institute during the congress.



NEW • ARC CONTROL SYSTEM • MOTORIZED ELECTRODES

for Faster, Low-Cost Metal Melting

The new "P" Series Detroit Rocking Electric Furnaces feature a simplified arc control system combined with motor-driven, pedestal-mounted electrodes.

The indirect arc is automatically controlled by a magnetic amplifier which adjusts motor speed in direct proportion to arc unbalance. This instantaneous action provides maximum heat per power input. There are no moving parts, relays or contactors to break or wear out.

Standard graphite electrodes are independently mounted on pedestals and motor driven. A ⅙ h.p. D.C. motor drives the automatic control. Direct-connected ⅓ h.p. A.C. motors on each electrode permit manual push-button control at greater speeds than possible by hand. This speeds electrode positioning for charging and shell change.

For full details on the new "P" Series indirect arc Detroit Furnaces, write for Bulletin 5610.

Ratings for furnaces with pedestal-mounted electrodes, motor controlled

Furnace Type	KW Rating	Nominal Cold Charge	Minimum Molten Metal
LFCP	125	350	500
LFNP	150	500	750
LFYP	175	700	1250
AAP	250	1500	3000
AAP	400	1500	3000
CMP	400	4000	8000
CMP	600	4000	8000

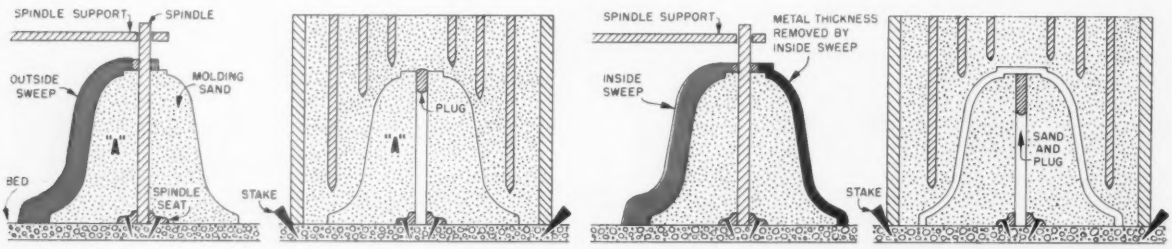
DETROIT ROCKING ELECTRIC FURNACES

Detroit Electric Furnace Division, Kuhlman Electric Company • Bay City, Michigan

Foreign Representatives: in BRAZIL—Equipamentos Industrias, "Eisa" Ltd., Sao Paulo; CHILE, ARGENTINA, PERU and VENEZUELA: M. Castellvi Inc., 150 Broadway, New York 7, N.Y.; MEXICO: Cia Proveedora de Industrias, Atenas 32-13, Apartado 27A3, Mexico 6, D.F., Mexico; EUROPE, ENGLAND: Birlec, Ltd., Birmingham.

Trouble Shooting

By C. W. AMMEN



Figs. 1 through 4 (left to right) show steps in sweeping a mold for a bell casting. Outside sweep first shapes the core, the cope next is rammed, and an inside sweep removes sand equal to metal thickness from core. Assembled mold is shown without the gating system in place

A Swept-Up Bell

Dear Charlie:

I have been singled out by a customer who insists that I make for him one nice, fat bell of first-quality tone. There is no haggle about price because my turkey is loaded, even though there is a limit, of course. You know me—I assured him that I not only was a number-one bellfounder, but also that I would not pick his eyes out pricewise. All this fancy talk came prior to seeing his print. This bell is 26 in. tall, a size which makes it neither a small nor a large bell, with 20-in. bottom diameter, and only one casting is required.

A pattern would at its cheapest be costly for one casting. Would it be possible to sweep up a bell of such a size? If so, how would one go about it? Leo says the green sand core might blow. Do you sweep cope and drag separately? Any special sand required? Gating? And what type of mix would you make up for a first-class tone?

In short, how does one go about making a plain bell of this size?

Sincerely,
Sam

Dear Sam:

I know you, Sam. All by yourself, you would make a good cross section of American foundrymen. Never say no can do—just jump in. I have seen castings much larger than your bell in one-man, backyard foundries, where the owner has no idea of how he is going to remove the gates and risers, much less melt enough metal to pour the job. But, does that faze him? Hell, no! I am convinced that the American foundryman will tackle anything, such as buttering a wild cat's tail with a hot skimmer.

I attended a large foundry meeting once at which everyone was asked to bring along a problem casting or print for roundtable discussion. As you might guess, one bird out of the 60-odd present brought a problem casting, and the remaining 59 or so proceeded to show this poor bird where he was wrong. There is no greater bunch of fellows in the world!

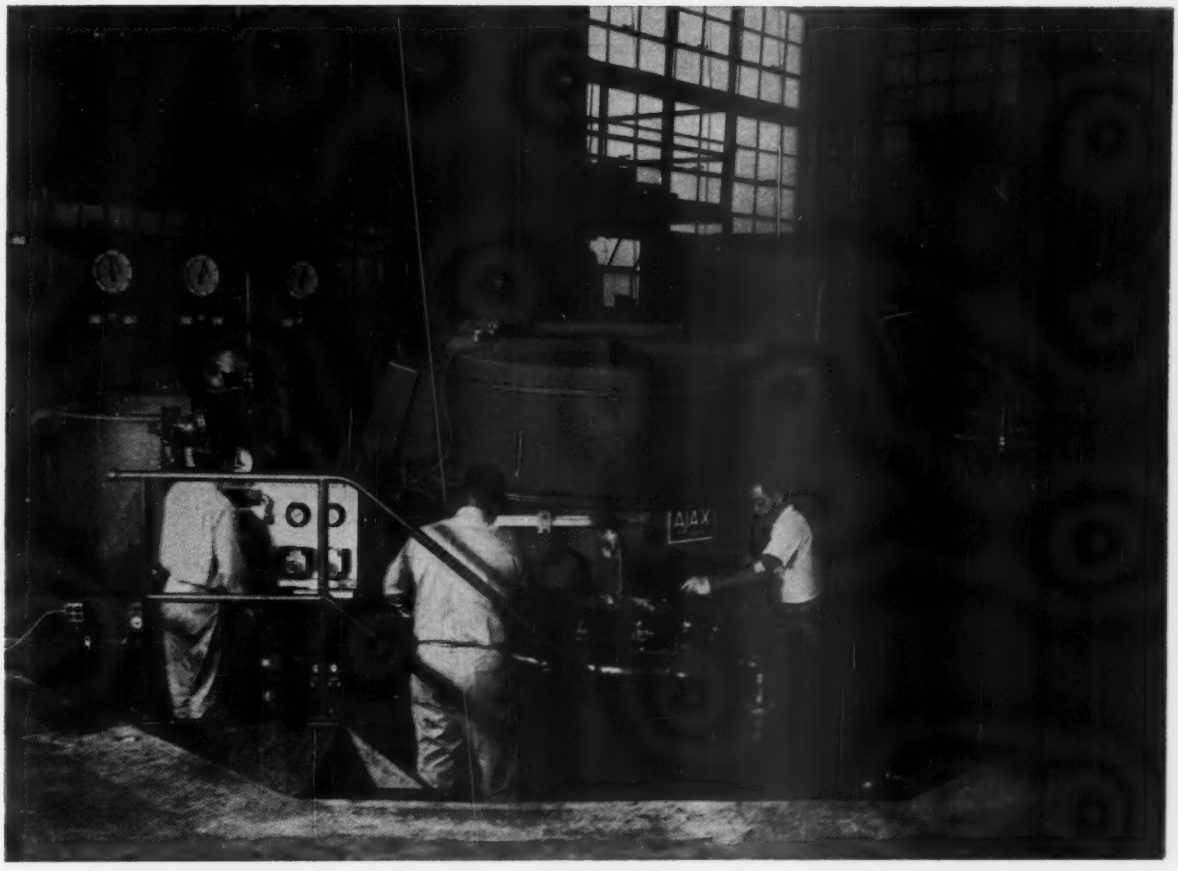
Let's return to your problem. Yes, I would sweep this bell up in green sand. It is not a tough job, but it does require patience and care. I don't understand exactly what you mean by sweeping up cope and drag separately. The drag is the only member which is swept. You need a spindle seat, a spindle, two sweeps (one which conforms to the outside shape and size of your bell and one which conforms to the inside of bell shape and size) and a cope of suitable size properly barred. With a big pile of sand and some elbow grease, away you go.

The first thing you must do is to make up a firm, flat bed of sand over a good coke vent. Mount the spindle seat in the center and stake it down firmly and level. Mount the outside sweep to the spindle which is in the spindle seat. This sweep is the shaving edge and conforms to the shape of the outside of the bell. Sweep up this shape (*A*, Fig. 1), making it fairly firm. The inside may, if you choose, be coked up and vented into the bed.

Once you have this job done, remove the sweep and spindle. Plug up the spindle hole to prevent it from filling with sand when you ram the cope. Dust the entire drag with parting powder and parting sand, claywash the cope, and place it over the swept form. Now stake down and mark the corners. These stakes will take the place of pins for removing the cope and for replacing it to its original position for pouring. Now, ram up the cope in the usual manner, using bars, gaggers, etc., where needed. Take care, however, not to ram *A* (Figs. 1 and 2) out of shape.

When the cope is complete, lift it and set it on a pair of trestles. Remove the plug in the spindle hole and replace the spindle. Next, with the inside sweep shave the sand to give the required inside shape and metal thickness. Remove the spindle and sweep. Plug up the spindle hole with a stock core and molding sand. Slick cope and drag, spray with molasses water and blacking, and skin dry all over. Return the cope to its original position as indicated by the stakes, weight up, and pour.

Gating is a matter of preference. Some bottom pour into the skirt in



MODERN ALUMINUM BILLET CASTING

Only the best in extrusion billet quality is good enough for **The Himmel Brothers Company**, Hamden, Conn. They produce architectural aluminum extrusions, most of which are subsequently anodized. Their new electric billet casting shop using an integrated group of induction melting furnaces has assured a consistent supply of top quality extrusion billets.

Billets are turned out at the rate of 2000 lbs. per hour by one supervisor and two men. Clean and cool working conditions, extensive automation, and negligible furnace maintenance provide a high return on this investment.

We should be pleased to give you more facts about this modern way of melting aluminum.

AJAX ENGINEERING CORP., TRENTON 7, N. J.

AJAX TAMA-WYATT

INDUCTION MELTING FURNACE

AJAX ELECTRO METALLURGICAL CORP., and Associated Companies
AJAX ELECTROTHERMIC CORP., Ajax-Northrup High Frequency Induction Furnaces
AJAX ELECTRIC CO., The Ajax-Hultgren Electric Salt Bath Furnace
AJAX ELECTRIC FURNACE CORP., Ajax-Wyatt Induction Furnaces for Melting

Circle 701 on Inquiry Card—Page 203

several spots, and others pencil gate into the top, using a slab of core on top of the green sand core to prevent washing, etc. The main object is to take your time and not to rush the job. Remember, a bell this size is hard to stuff back into the furnace, to say the least. I don't know whether the core will blow or not, but if properly vented and dried it should not kick. I would, however, be sure that my sand carried at least 2 per cent combustibles, such as wood flour, to prevent expansion scabs or such.

Where metal composition is concerned you get a million answers, each claiming to be the best by far. A standard, first-class-tone bell mix is 78 Cu and 22 Sn. For very large bells, 76 Cu and 24 Sn is used. For ship bells, a common composition is 82 Cu, 12 Sn and 6 Zn. You could compile several hundred bell mixes, but they are basically copper and tin. For my money, the first mix is as good as any. Shape, clapper size and mounting also affect the tone of the bell, I am told. Perhaps someone can supply you with some B-flat ingots.

I know of at least one foundryman who now is in the foolish factory after an attempt to make a large order of small bells for the Navy, all of which had to ring a perfect B flat or some such nonsense. But no two sounded alike.

Sincerely,
Charlie

ASM Distributes Home Study Courses on Metals Subjects

Four home study courses of the new Metals Engineering Institute, a division of the American Society for Metals, are ready for distribution. They represent an attempt by ASM to help alleviate the critical shortage of technical manpower. The courses are intended for both individual study and in-plant training. Five more courses—including one on foundry practice—are scheduled for release early in 1957.

The first four courses are "Elements of Metallurgy," "Heat Treatment of Steel," "Titanium" and "High Temperature Metals." In preparation for two years, the courses are edited by authorities in their fields. They are intended to permit persons unable to attend formal classes to continue their education in their leisure time.

Information on the courses is available from the ASM Metals Engineering Institute, 7301 Euclid Ave., Cleveland 3, O.

Silvery Pig Iron

Originated 84 years ago, Globe Silvery Pig Iron has remained in a class by itself. It provides accurate silicon control with all grades ranging from 6 to 16% silicon.

A skilled metallurgical staff is available to help you select the correct grade for your specific requirements.

- **Made from all-virgin ore.**
- **Uniform structure — uniform melting and even silicon distribution.**
- **Readily identified and easily handled by magnet or hand.**

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IRON ORE • PIG IRON
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Circle 702 on Inquiry Card—Page 203

Ferroalloys

Ferrosilicons
High-Carbon Ferrochromes
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Other Specialty Alloys

Thoroughly modern, the plant at Beverly, Ohio, is ideally situated to distribute its diversified ferroalloy products by rail, water, and truck.

It is staffed by highly competent operators, research, and metallurgical engineers who are available for consultation on your needs.

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Circle 703 on Inquiry Card—Page 203

Sounder, cleaner metal...

Lower scrap loss...

Reduced labor...

with HARBISON-WALKER REFRACTORY GATE and RUNNER TILE

CLEANER METAL

Harbison-Walker Gate and Runner Tile are strong and withstand rapid metal flow without excessive erosion. Cleaner metal is the result.

LESS SCRAP LOSS

Tile of minimum diameters may be used, with considerable reduction of metal in gates, and consequent savings in scrap loss.

REDUCED GAS INCLUSIONS

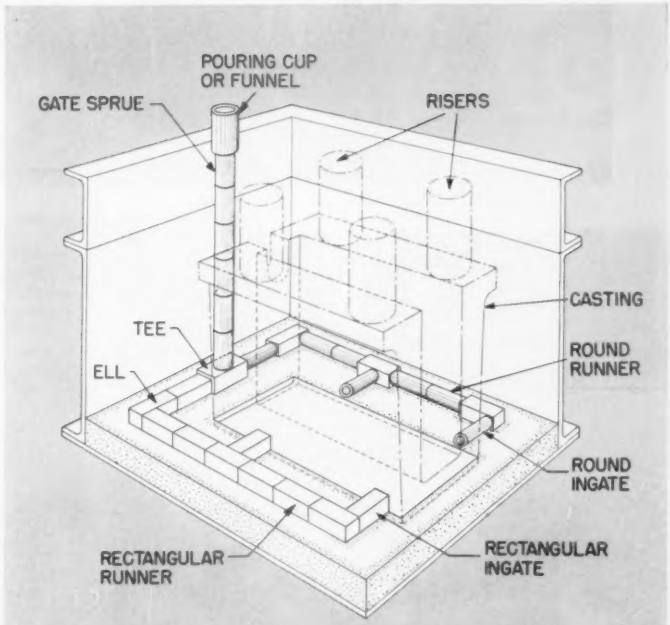
Refractory tile are much stronger than sand, permitting pouring under high pressure. This practice reduces gas inclusions.

EASIER TO USE

Installation in the mold is easier and faster, and overall cost is less.

TIGHT JOINTS ASSURED

The excellent workmanship of Harbison-Walker Gate and Runner Tile accounts for their good tight fit.



ALL SIZES AND SHAPES NEEDED FOR COMPLETE GATING SYSTEMS

The drawing above shows a model arrangement illustrating how various shapes are used. The casting is shown in phantom.

Harbison-Walker tile are supplied in approximately 200 sizes and shapes. These include cups or funnels, round and square tile with plain or jointed ends, crosses, tees and ells. Many of the more popular sizes are available from stock.

Write for catalog of sizes from which to select those best adapted for your needs.

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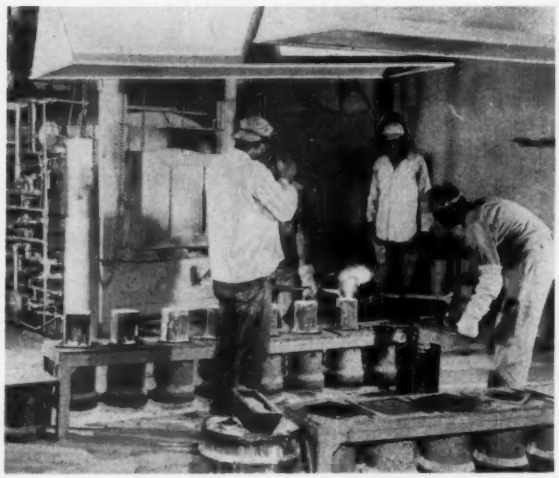
World's Most Complete Refractories Service

GENERAL OFFICES: **PITTSBURGH 22, PENNSYLVANIA**

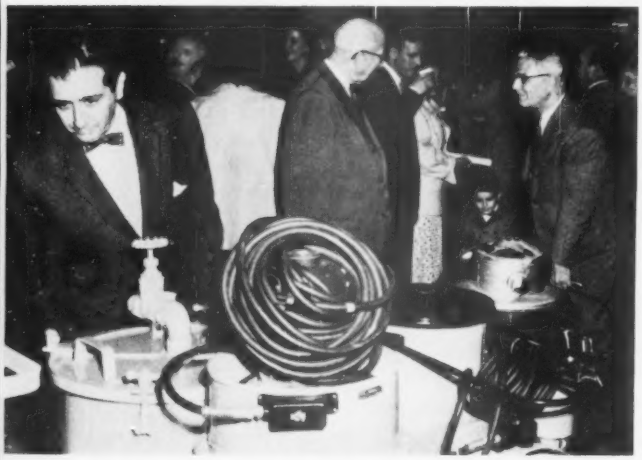
News Views

SUPPORTS FEF: Archer-Daniels-Midland Co. rang up a total of $20,000 contributed to the Foundry Educational Foundation since 1947 when Warner B. Bishop Jr., ADM, presented his company's annual check for $2000 to FEF President James H. Smith, Central Foundry Division. Left to right are Walter Sicha, Prof. Willard Nudd, Mr. Smith, Mr. Bishop and Prof. John F. Wallace

METALFINISHING SHOW: Significant new techniques in coated abrasive grinding and finishing of metals were demonstrated at the second National Metalfinishing Show in Cleveland recently. An estimated 3000 production men from metalworking firms saw the show, which was sponsored by the Behr-Manning Co., Troy, N. Y.



CHECKING A HEAT: Arwood Precision Casting Corp. recently held an open house at its Los Angeles plant, the newest of its four foundries. In the view shown above, foundry employees are demonstrating how pouring temperature for each heat is checked accurately with an optical pyrometer. Investment castings are produced at this Los Angeles foundry by the lost-wax process



EYECATCHERS: Portable vacuum cleaners manufactured by the Spencer Turbine Co., Hartford, Conn., attracted considerable attention at a recent open house at the company. Nearly 400 Spencer employees, their families and their guests toured the plant and inspected the facilities and products of the company

LET US TELL YOU ABOUT OUR OPERATION

Impeccable hand-finishing and uncompromising inspection guarantee the perfection of every pattern you get from Pyle. In each phase of our highly integrated operation, the long experience of Pyle craftsmen assures rigid adherence to your prints and to your shipping dates.

Patternmaking at Pyle may not embrace all the drama of surgery . . . but pinpoint precision and devotion to detail are just as important here as in the operating room.

At Pyle your pattern is prepared by men averaging 19 years experience. From a minutely accurate wooden model, it is cast in our own foundry — designed, equipped and operated exclusively for pattern production. The aluminum or magnesium casting is then tooled on machines best suited to your needs . . . lathes, radial drills, milling machines, planers, hydraulic or automatic duplicators. Flawlessly hand-finished and meticulously inspected, it is shipped to meet your deadline.

The consistent thoroughness of our operation has won us friends among America's most respected firms. May we become friends with you?

PYLE

PATTERN AND MANUFACTURING COMPANY

Muskegon, Michigan

Circle 705 on Inquiry Card—Page 203

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FLOW

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Use ONLY

Famous

CORNELL

CUPOLA FLUX

STEP

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REJECTS

Often Imitated

. . . Never Equalled!

DUE

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IRON

Why it pays to use Famous CORNELL Aluminum and Brass Flux

- Makes metal pure and clean.
- Permits use of more scrap without danger of dirt, porous places or spongy spots, due to dirty metal.
- Thinner, yet stronger sections can be poured.
- Metal does not cling to the dross as readily.
- Crucible or furnace linings are kept clean and preserved.
- Cleanses molten brass (whether red or yellow) even when the dirtiest brass turnings are used.
- Saves considerable tin and other metals.
- Forms a perfect covering over the metal during melting, prevents oxidation and reduces obnoxious gases to a great extent.

Write for Bulletin 46-A

The CLEVELAND FLUX Company

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FAMOUS CORNELL FLUXES

Trade Mark Registered

A banquet and floor show concluded the conference. Left to right at the speaker's table: John Allan, St. Catherines Brass Works; Walter E. Wenninga of Waldor Enterprises Ltd.; Alex Pirrie of American-Standard Products Ltd., national director of AFS; Everett Chapman, consultant and speaker; Frank W. Shipley, Caterpillar Tractor Co., national president, AFS; A. J. Moore, Canadian Bronze Co., conference vice chairman; William W. Maloney, general manager, AFS; Morris G. McQuiggan, LaSalle Coke Co., chairman of Eastern Canada chapter; Frank W. Kellam, Electro Metallurgical Co., Ontario chapter chairman; I. H. Dennen, Beardsley & Piper Division, Pettibone Mulliken Corp.; Joseph Sully, Sherratt Brass Foundry Ltd. and Turney W. Shute, Canadian Steel Foundries Ltd., chairman of the conference

Plant Visits Are Important Part of

CANADIAN FOUNDRY CONFERENCE

By ROBERT H. HERRMANN
Associate Editor

EASTERN Canada, Ontario and British Columbia Chapters of the American Foundrymen's Society co-sponsored the sixth successful All-Canadian Conference Nov. 8-9 at Sheraton Mount Royal Hotel, Montreal.

At the inaugural luncheon, George Monney, director of the St. Lawrence Municipal Bureau, Montreal, spoke of excellent co-operation between the United States and Canada in developing the St. Lawrence Seaway waterway which is expected to be opened for use in 1959.

Frank W. Shipley, Caterpillar Tractor Co., Peoria, Ill., and national AFS president, addressed the opening technical session on AFS activities conducted for the benefit of the members and spoke of society plans for establishing a training and research foundation for expansion of research projects. He also urged attendance at the 1957 National Convention at Cincinnati. Theme of the conference will be "Quality, Utility and Economy of Modern Castings."

First technical paper, **Plastics for the Foundry Industry,** was presented by Walter E. Wenninga, Waldor Enterprises Ltd., Montreal. A brief history of polyester and epoxy resins was given. Epoxies are important for tooling because they cure without bubbles, have low shrinkage, good strength and water and chemical resistance. For patterns and coreboxes they offer manufacturing simplicity, good wear resistance, low maintenance, good sand release, light weight, and good storage life. In addition, their cost is low.

Disadvantages are that resin and hardener mixtures have a relatively short life and must be used quickly. They stick tenaciously to most clean materials; consequently good mold release agents must be used in making patterns, and tools must be cleaned immediately after use, otherwise the hardened plastic is difficult to remove. Many resins develop high heat during curing and will crack if the mass is great. Therefore they must be used for comparatively thin facings and backed up with a low exothermic resin which is of inferior quality.

Methods of making plastic tools as laminates with glass fiber and by

Conference Scuttlebutt

In conference hallways, where comments are less guarded than in the confines of formal technical sessions, somebody said that 50 per cent of the cores used in making engines for 1958 model automobiles will be made with resin-bonded sand. Most of them will be hollow.

* * *

Cold-set bonds will not play an important part in high-production foundry core work. Process is too slow. The cold-set method is making good headway in jobbing shops, however, particularly for large cores. One foundry produces 800-lb cores in 15 minutes. A 3-ton core has been made in 45 minutes. Baking time is reduced about one-third. Consensus is that cold-set binders are good for cores of 50 lb or heavier.

* * *

As for metals, look for more aluminum to replace cast ferrous parts. Most of Chevrolet's new Turboglide transmission is aluminum. Internal precision cast aluminum parts, the die cast aluminum transmission case and inherent design factors have reduced weight to the point where the Turboglide adds to the car only 4 lb above the weight of the standard transmission. The older Powerglide automatic transmission adds 92 lb.

* * *

All the gravy doesn't flow in one direction, however. A gray iron foundryman is fast pulling his company back to using cast iron frames and end brackets for electric motors instead of die-cast aluminum units. Why? Because proper design and careful foundry practice have enabled him to meet required tolerances, produce very small green sand-cored holes, reduce weight and bulk, and offer a finished part at substantially lower cost.

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CARBORISE

(artificial graphite)

A DEPENDABLE, LOW-COST ADDITIVE TO INCREASE CARBON CONTENT...

of uniform quality and carefully controlled mesh to meet your specifications.

"....everything in carbon"

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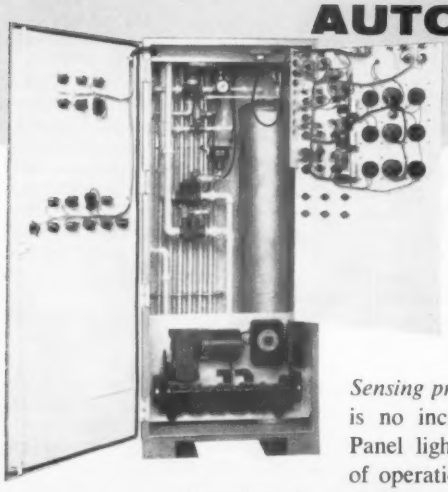
Circle 707 on Inquiry Card—Page 203

COMPLETE

Sand Mixing

AUTOMATION IS HERE



Entire mixing sequence automated from single cabinet! Works on any batch type mixer. Fast, simple setting for positive moisture control.

Sensing probe is in mixer... there is no increase in mulling time. Panel lights identify each phase of operation.

Complete details sent upon request.

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casting with resin alone were discussed. Typical equipment was shown and described.

Shrinkage Defects and Their Control in Cast Iron—by John Allan, St. Catherines Brass Works, St. Catherines, Ont. Interpretation of what is a good casting is the deciding factor as to whether a part with a shrinkage defect is a reject or is acceptable commercially. The paper described such a defect and ways to recognize it.

Avoiding a shrinkage defect is not a cut and dried affair. Methods of reducing shrinkage include 1) designing the casting properly, 2) using a gating system that will promote directional solidification and 3) using metal of proper analysis to suit requirements of the casting. Among influencing factors are pouring technique, metal temperature, melting conditions, sand deformation, sand moisture content, sand permeability, mold density, degree of fit between jackets and molds and mold weight handling practice.

A complicating factor in all preventive measures is that serious doubt exists as to whether or not molten metal poured at the same temperature, at the same rate into the same gating system will fill the mold cavity in precisely the same way each time.

Mr. Allan's paper was presented in full in FOUNDRY for December, page 88.

Mechanization in Small Foundries, a film prepared by Beardsley & Piper Division, Pettibone Mulliken Corp., Chicago, was presented with commentary by I. H. Dennen of that company. It portrayed the application of modern material handling equipment and techniques to production jobbing work in small foundries. Mr. Dennen foresees a great future for such applications and believes that small foundries should participate in the industry growth to take place through use of modern methods.

The paper, **Nitches and Notches,** by Everett Chapman, West Chester, Pa., concluded the conference. Ductility is not characteristic of a metal but of stress loading. The manner of loading can eliminate ductility characteristics of any metal. Although total stress of a part is important, stress distribution is more important in the life of a part. Distribution is affected by shape. Consequently, proper design is essential.

Slides and a movie showed stress patterns in parts which had nicks on their surface and/or holes in supposedly solid sections.

Plant visits during the morning of each day were an important part of the conference.

Circle 708 on Inquiry Card—Page 203

Circle 709 on Inquiry Card→

WANT TO MELT A MOUNTAIN OF METAL?

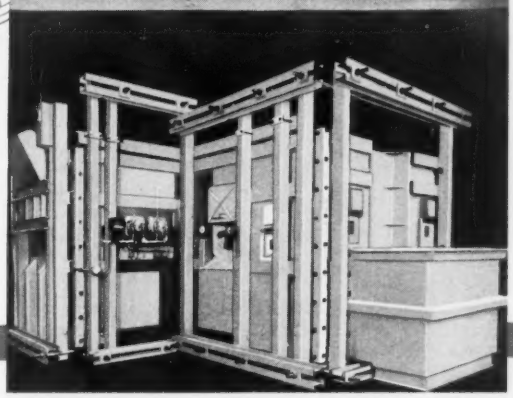
THESE BIG STROMANS WILL DO IT...BUT FAST!

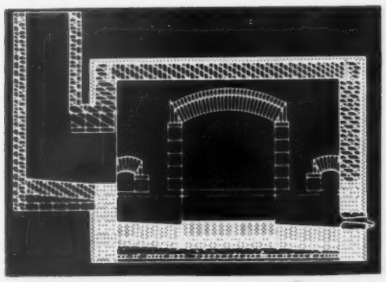
STROMAN LARGE SIZE REVERBERATORY FURNACES

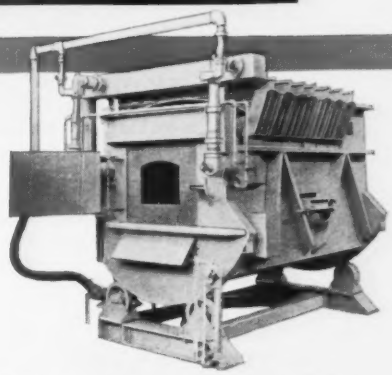
For Melting Unlimited Capacities of Aluminum, Zinc or Brass

These reverbs are built to assure heavy duty production for Smelting, Extrusion work, Die Casting, Permanent Molding and Foundry melting. Now in operation in some of the most prominent plants in the country, they have proved their ability to deliver large tonnages of metal, are easy to work with and around . . . operate most economically and are easy to maintain. Their efficiency and economy will amaze you and convince you of their superiority.

Furnaces of this type are designed to meet customers' individual requirements . . . let our engineers show you how to achieve utmost efficiency and economy in your melting operations.

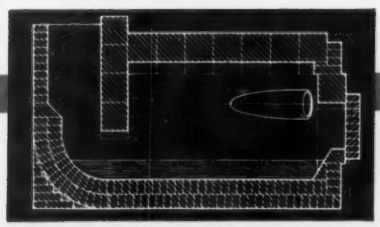




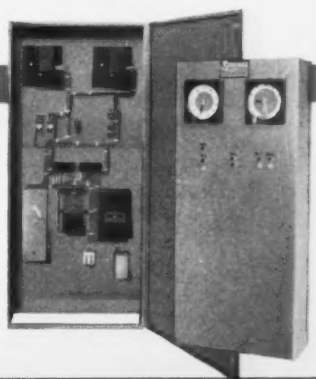


STROMAN TYPE "SW" CRADLE TILTING FURNACE FOR ALUMINUM MELTING SIZES FROM 1,000 TO 3,000 POUNDS

An ideal furnace for breakdown to supply hot metal to holding furnaces for die casting or permanent mold. Also for distribution to the molding floor in sand casting foundries. Tilted by means of an air or hydraulic ram. Furnished complete with gas or oil burners or combination burners, blower to furnish combustion air, and lining made of standard fire brick shapes.



Automatic temperature and safety controls available if desired.



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Stroman design monitor for furnace metal temperature, refractory temperature, high limit blower motor, circuit, electric ignition, and flame safety control, with completely automatic built-in warning system.

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Foundry Group Meetings

Utah: About 100 interested foundrymen met in Provo, Utah, on Nov. 19 for the selection of a steering committee and officers for the proposed AFS chapter that will unite with the national organization on Jan. 21 at Salt Lake City. The first meeting was held on Oct. 31 at Salt Lake City and a petition was signed seeking membership in the AFS.

At the Oct. 31 meeting, Frank S. Brewster, director of research and development, Brumley-Donaldson Co., Los Angeles, presented a talk stressing the importance of control in foundry sand practice. He indicated that new processes and methods will not excuse lack of control but instead will demand more of it.

Steering committee and officers for the first term of the new chapter are: Chairman, A. S. Klopf, manager of marketing, American Gilsonite Co.; 1st vice chairman, C. C. Cardall, plant superintendent, Pacific States Cast Iron Pipe Co.; 2nd vice chairman, D. N. Rosenblatt, chief metallurgist, American Foundry & Machine Co.; secretary, E. R. Rowe, manager, Industrial Carbon Sales, American Gilsonite Co., and treasurer, Fred Hafen, general foundry foreman, Pacific States Cast Iron Pipe Co.

Directors, three-year term, are J. N. Carter, general manager, American Foundry & Machine Co. and W. W. Brown, plant metallurgist, Pacific States Cast Iron Pipe Co. Directors, two-year term, are Joy Nielson, foundry superintendent, Columbia-Geneva Steel Division, U. S. Steel Corp., and Byron R. McKay, president, Star Brass Foundry & Refining Co. Directors, one-year term, are Everett H. Backman, general manager, Backman Foundry Co. and Jack May, general manager, Lundin & May Foundry Co.

Committee chairmen are: Program, Mr. Cardall; Membership, L. C. Skelton, Columbia-Geneva Division, U. S. Steel Corp.; Entertainment, Glen Brown, Lundin & May Foundry Co.; Reception and Attendance, Mr. Backman and Publicity, J. Merrill Bushman, Pacific States Cast Iron Pipe Co. — *J. Merrill Bushman, Pacific States Cast Iron Pipe Co.*

St. Louis: J. B. Caine, consultant, Wyoming, O., discussed "How To Do A Better Job With Green Sand" at the November meeting of the AFS chapter. Mold hardness was emphasized as being an important factor in quality green sand molding. Attention must be paid to mold corners and vertical surfaces where hardness is likely to be insufficient. Pouring also was offered as a major factor in consistent production of sound castings. Sand flowability was presented as probably the most important single characteristic of molding sand.—*Ralph E. Johnston, East St. Louis Casting Co.*

Michiana: Dan Krause, executive technical director, Gray Iron Research Institute, Columbus, O., addressed the AFS chapter on Nov. 12 at the Normandy Club, Mishawaka, Ind., on "Foundry Research and Development." During his talk, Mr. Krause discussed briefly the International Foundry Congress, recently held in Dusseldorf, Germany.—*Richard G. Wiest, Dalton Foundries Inc.*

Texas: Frank M. Scaggs, general coreroom foreman, Oklahoma Steel Castings Co., Tulsa, Okla., addressed the AFS chapter on "CO_2 Core Practices" at its Oct. 19 meeting with the San Antonio Section chapter at the Menges Hotel, San Antonio, Tex. About 90 members and guests attended the meeting, some of whom traveled more than 200 miles. Eighteen members of the Texas A & M student chapter traveled 160 miles from College Station, Tex., to sit in on the discussion. Mr. Scaggs detailed the practices involving CO_2 coremaking at his steel foundry where 50 to 70 per cent of the cores are made by this method

The chapter journeyed to the Caddo Hotel, Shreveport, La., on Nov. 16 to hear Clifford E. Wenninger, technical director, Hydro-Blast Corp., Chicago, talk on "Sand Reclamation." Elmore C. Brown, district manager, Whiting Corp., chapter program chairman, introduced the speaker, and W. A. Bearden, sales representative, M. A. Bell Co., chapter chairman, presided.

Mr. Wenninger traced the development work behind today's wet sand reclamation systems and elaborated upon both wet and dry types of equipment with helpful information about the economics of operation of both types. When more than 15 tons of sand per hour is required, it is economical to install a wet sand reclamation system, according to the speaker. He also indicated that it is economical to install a dry sand reclamation system where sand consumption is as low as 8 tons per day. —*C. Eugene Silver.*

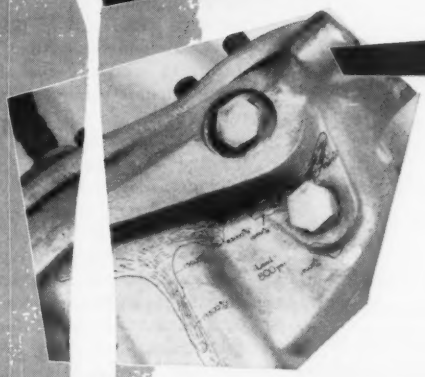
Central Ohio: A short course on sand technology, attended by 100 persons, was sponsored by the AFS chapter on Nov. 12 at the Seneca Hotel, Columbus, O. Panel members were Clyde A. Sanders, American Col-

SCHOLARSHIP WINNERS: Among the students who have received Foundry Educational Foundation scholarships at Pennsylvania State University are the eight shown above. They received their certificates at a recent dinner that was sponsored by the Penn State Industry Advisory Committee. From left to right are Michael Eleftherion, Joseph Bernhardt, Robert Crozier, Stanley Sharpe, William Kilpatrick, Wayne Watson, Edward Jerdonek and Jerome Schmitt. At right of the group are H. P. Good, foundry manager, Textile Machine Works, and B. W. Niebel, head of the department of industrial engineering at Penn State

Three Steps to Better Castings and Increased Profits

specify 1.

Settling certain points with your customer at the outset insures your profit and his satisfaction upon delivery of the completed order. First determine the service requirements of the casting and characteristics desired. Establish a standard which satisfies the needs at a reasonable cost. Find out if the design is satisfactory functionally, structurally and *foundry-wise.*



design 2.

Good design insures trouble-free foundry practice, profitable operation and customer satisfaction. Castings with even stress flow are more serviceable and easier to pour. Experimental stress analysis with M Stresscoat brittle lacquer enables your engineers to make design changes without guesswork or wasted effort. Design for service, easy casting, and high profits.

inspect 3.

M Magnaglo (M Zyglo for non-ferrous) is recommended as a "finger on the pulse" means of determining the causes of cracking in the foundry. Simple tests immediately after shakeout or cleaning can locate cracking when it first occurs and enable you to take corrective steps no matter what the cause. With sampling inspection you can actually control the quality of the entire run as it is being poured. You do not waste time and profits handling, heat treating, finishing, etc., intermittent lots of cracked castings. It all adds up to better products for the customers and higher profits for the foundry!

Write for details on how Magnaflux nondestructive testing methods can be employed to increase the yield of usable castings and foundry profits. No obligation, of course!

HALLMARK OF QUALITY IN NONDESTRUCTIVE TESTING

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New York 36 • Pittsburgh 36 • Cleveland 15
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from START
to FINISHing

...in foundries
it's
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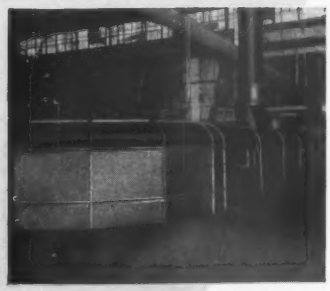


COOLING—Large volume of air passing through cooling tunnel removes fumes, cools molds.

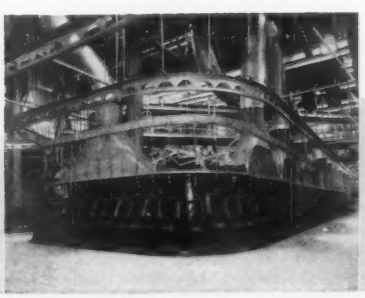
You'll find KIRK & BLUM Systems in leading foundries. To control dust and fumes from all foundry operations, count on KIRK & BLUM for the complete job—design, fabrication and installation.

From 50 years of experience, Kirk & Blum Engineers have gained skill that can be used effectively in your foundry, large or small. For a no-obligation survey or further information, write: The Kirk & Blum Mfg. Co. 3239 Forrer Ave., Cincinnati 9, Ohio.

GRINDING-SNAGGING — Battery of double grinders exhausted by Kirk & Blum system; dry collection.

KIRK & BLUM

DUST AND FUME CONTROL SYSTEMS



POURING — Hood collect fumes over entire length of moving floor, "Pouring" station.

loid Co., Chicago; O. Jay Myers, vice president, Foundry Division, Reichhold Chemicals Inc., White Plains, N. Y., and S. C. Massari, technical director, AFS. Mr. Myers served as moderator. Green and core sand mixtures and preparation were discussed. Slides demonstrating a variety of defective castings were shown. Causes of the defects were discussed.—*Jose Acebo, Ohio Malleable Division, Dayton Malleable Iron Co.*

Connecticut Non-Ferrous: The Connecticut Non-Ferrous Foundrymen's Association met Oct. 17 at Quinnipiack Club, New Haven, Conn., to hear a discussion of "Kiss Gating —Economics and Techniques" presented by Ezra Meltzer, methods manager, and Martin Swanson, pattern superintendent, Burndy Engineering Corp., Norwalk, Conn.

The talk described a method of applying the pattern directly against the runner or "kissing" of the two. Large drawings and samples of gated castings illustrated the speaker's work and investigations with kiss-gating in sand and also shell molding using various copper base and aluminum alloys.

Advantages cited are 1) absence of ingates with less area wasted and an increase up to 25 per cent in casting cavities per mold, 2) elimination of ingates and reduced runners increases yield up to 60 per cent, 3) less misruns due to wider and lower pouring temperature ranges, 4) improved surface condition for sand castings, and 5) ease of removal of castings from gate and less grinding cost, particularly on small items.

It was pointed out that many items which cannot be kiss-gated in green sand can be handled successfully in shell molding, particularly the split pattern type of castings.—*Frank B. Diana.*

Wisconsin: The AFS chapter held sectional technical meetings at its Nov. 9 meeting at Hotel Schroeder, Milwaukee. Following dinner and before the technical sessions, the chapter was entertained by the Milwaukee Gas Light Co. quartet.

Ray A. Witschey, A. P. Green Fire Brick Co., Mexico, Mo., talked on "Refractories for Malleable Iron Melting." L. E. Brooks, International Harvester Co., Waukesha Works, Waukesha, Wis., acted as chairman. "Pattern Shop's Position in Plastic Tooling" was the subject of George M. Rice, director of sales, Ken Plastics Inc., Lansing, Mich., before a group chairmanned by Herbert Wright, Kindt-Collins Co.

R. W. Tuthill, supervisor, welding engineering unit, General Electric Co.,

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Unground Sand	4098	4085	4060	4040	4030	4020	5040	5030	5025
Ret on 20 Mesh	2.2								
Thru 20 ret on 30	38.6	12.4	5.6	0.6	0.4	0.4			
Thru 30 ret on 40	57.6	70.8	56.2	37.2	30.2	21.2	4.0	1.2	0.6
Thru 40 ret on 50	1.4	16.3	34.8	52.0	55.8	51.4	34.8	30.4	23.8
Thru 50 ret on 70	0.2	0.5	2.8	9.0	11.4	20.6	44.4	48.2	42.0
Thru 70 ret on 100			0.6	1.0	1.8	5.2	14.4	17.8	26.4
Thru 100 ret on 140				0.2	0.4	1.0	2.0	2.0	6.2
Thru 140 ret on 200						0.2	0.4	0.4	0.8
Thru 200 ret on 270									0.2
Grain Fineness (AFS)	25.88	30.49	33.72	37.48	38.82	42.22	49.96	51.64	56.90

Unground Sand	5015	5010	5005	7030	7020	7010	C-30	C-10
Ret on 20 Mesh								
Thru 20 ret on 30								
Thru 30 ret on 40	1.2	0.4	0.2	0.2	0.2			
Thru 40 ret on 50	15.2	11.2	4.4	3.0	2.4	0.4		
Thru 50 ret on 70	40.2	35.2	31.2	26.2	18.0	8.2	0.4	0.2
Thru 70 ret on 100	35.4	37.4	41.2	42.0	45.0	46.6	28.4	8.4
Thru 100 ret on 140	6.4	10.8	15.4	16.4	20.0	23.2	44.8	50.2
Thru 140 ret on 200	1.2	4.0	5.6	9.6	11.0	15.4	18.8	28.2
Thru 200 ret on 270	0.4	0.8	1.4	1.8	2.4	4.2	5.0	8.8
Thru 270 ret on 325		0.2	0.6	0.8	1.0	2.0	2.6	4.2
Grain Fineness (AFS)	60.20	66.92	73.92	79.36	84.42	95.44	108.22	124.60

Ground Sand (Flour)	80M	100M	140M	200M	300M	325M	400M
Ret on 60 Mesh	10/20%						
Thru 60 ret on 100	25/30%	5%					
Thru 100 ret on 140	15/20%	14%	4%	1%			
Thru 140 ret on 200	10/15%	16%	6%	4%	2%	Trace	
Thru 200 mesh	25/40%						
Thru 200 ret on 270		10%	12%	6%	2%	0.5%	Trace
Thru 270 ret on 325		12%	8%	9%	11%	4.5%	2%
Thru 325 mesh		43%	70%	80%	85%	95.0%	98%

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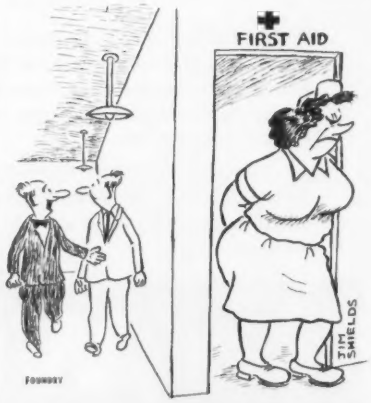
York, Pa., discussed "CO_2 Welding" before a group that had Paul B. Hiemenz, Falk Corp., serving as chairman. "Why You Have Scabs and Buckles" was the topic of Joseph A. Gitzen, president, Delta Oil Products Co. Edward Gibson, Grede Foundries, was chairman. G. A. Conger, C & S Products Co., spoke on "Shell Cores for the Green Sand Foundry" with Walter Puzach, Ampco Metals, acting as chairman.—*John E. Hubel.*

Northeastern Ohio: Despite poor weather, about 175 members and guests of Northeastern Ohio Chapter of AFS were on hand at the Nov. 8 meeting at the Tudor Arms Hotel, Cleveland.

Chairman Alexander D. Barczak, Superior Foundry Inc., brought the group up to date on progress on the new $3½ million Cleveland Trade School to which the chapter has presented an airless blast cleaning machine and a milling machine. He discussed the television program which the chapter will present on Feb. 10 over station KYW-TV, Cleveland, as one of a series of programs sponsored by the Joint Engineering Societies Council. Theme of the program will be light metal founding.

Chairman Barczak also announced a technical symposium on gating and risering to be given at Case Institute of Technology on Jan. 8, 15, 22 and 29. In addition, the Harry W. Dietert Sand School will be in session at Case Mar. 19-21.

James J. Schwalm, Federal Foundry Supply Co., chairman of the membership committee, announced the addition of 21 new members of the chapter during the preceding month, and he described a membership contest which will close with the May



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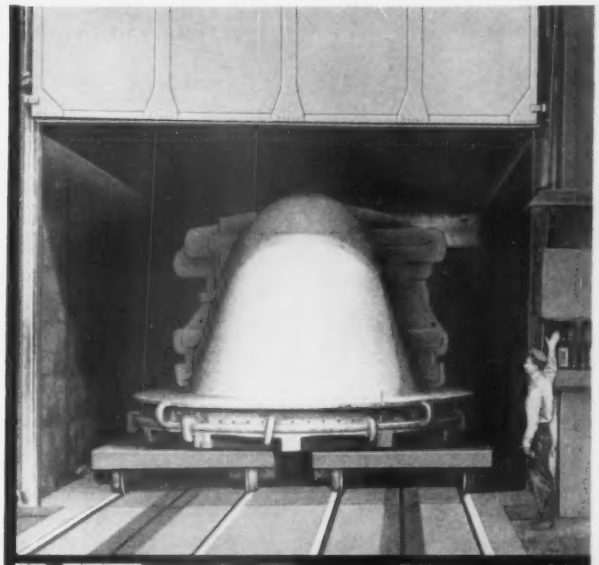
MIDDLE RIGHT—This rack type core baking oven is at the Fremont Foundry Co., Fremont, Ohio. It is equipped with a recirculating combination gas-oil fired heating system.

BOTTOM RIGHT—Vertical Core Oven (unloading position) at A. C. Williams Company, Ravenna, Ohio. This oven is 11'-0" wide x 11'-0" deep x 45'-0" high.

BELOW—Our standard rolling drawer type core baking oven. The heating equipment (not shown) may be mounted on floor beside unit or on the roof. Particularly adaptable to brass and aluminum foundries.



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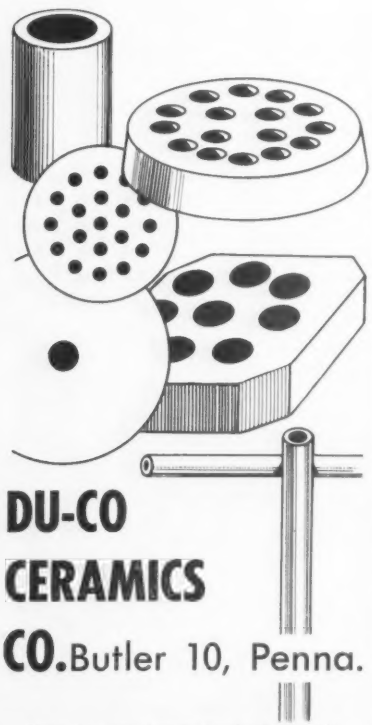

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meeting of the chapter. The individual who signs up the most new members will receive a transistor radio.

Speaker for the evening was John A. Mueller, manager, Grinding Laboratory, Carborundum Co., Niagara Falls, N. Y., whose topic was "Save on Snagging and Cutoff." Mr. Mueller stated that the annual cost of cutoff and grinding wheels to the foundry industry is $25 million. Proper selection and use of these wheels thus is economically important.

Regarding wheel speed, Mr. Mueller stressed that constant surface speed must be maintained as a wheel wears down. Otherwise productivity falls (about 11 per cent per inch of wear), power use drops, and more abrasive is required to remove metal. Surface speed should not be confused with revolutions per minute, and wheels should not be run too fast.

For maximum efficiency at minimum cost, these factors are important: Constant surface speed, pressure consistent with the type of work being done; use of dense structure wheels and operation at the highest permissible speed. These points apply generally to cutoff wheels as well as to snagging wheels. — *Jack C. Miske.*

Detroit: Two speakers addressed the Nov. 15 meeting of the AFS chapter at Tuller Hotel. James Hesse, research metallurgical engineer, R. Lavin & Sons Inc., Chicago, spoke on nonferrous foundry operations, and Charles F. Walton, technical director, Gray Iron Founders' Society, Cleveland, covered gray iron operations.

Mr. Hesse listed nonferrous metals which are castable and outlined molding methods by which nonferrous castings can be made.

Mr. Walton showed statistics on trends in the use of gray iron castings in recent years, saying that gray iron castings shipments are expected to exceed 14 million tons in 1956. He told of GIFS activities in promoting the use of gray iron castings and described other society services offered gray iron foundries.

Results of a recent questionnaire sent to design engineers and industrial purchasing agents to determine their knowledge of cast iron properties and the extent to which they use gray iron castings were summarized. Indications are that foundries must do a better job of acquainting those two groups of people with the advantages of gray iron castings. Also, to compete with other

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metal fabricating industries, foundries need an aggressive, more efficient management staff which will make use of modern engineering and marketing practices.—*Robert H. Herrmann*

Central New York: About 90 members and guests of the AFS chapter met at the Onondaga Hotel, Syracuse, N. Y., on Nov. 9 to hear William J. White, plant manager, Carver Foundry Inc., Fairview Village, Pa., talk about "Shell Molding and Coremaking." Slides illustrating some complicated cores were shown. —*William P. Ward, Oberdorfer Foundries Inc.*

Pittsburgh: Clyde B. Jenni, chief metallurgist, General Steel Castings Corp., Eddystone, Pa., talked on "Design Of Steel Castings To Meet Competitive Materials" before the AFS chapter on Nov. 19. He discussed steel casting design and how it can be improved to meet engineering needs and produce a good quality product. He explained unique qualities and properties of castings and emphasized need for better relationship between foundries and design engineers.

"To be good salesmen for our company and for our industry," Mr. Jenni said, "we must know the inherent properties and advantages of castings. Some advantages are uniformity of structure, distribution of metal where it is needed and the variety of combinations of strength and ductility that can be attained through use of various alloys and heat treating."

The speaker said correct steel casting design leads to economical casting production and satisfactory service. Foundrymen need not be designers but they must work together with designers and on the other hand, designers should understand foundry-

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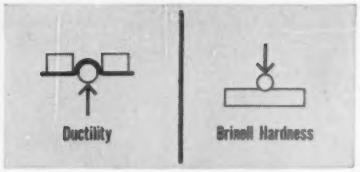

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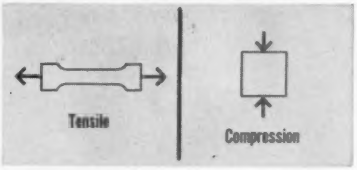

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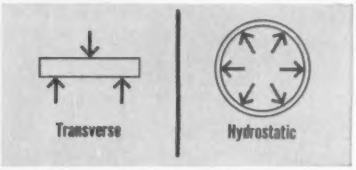

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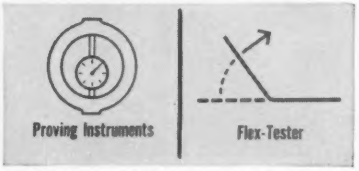

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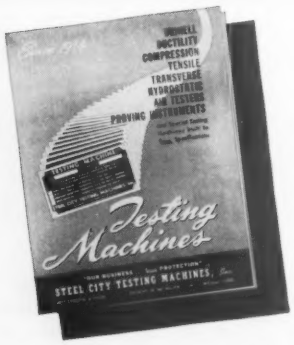

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men's problems as much as possible.

Mr. Jenni is also serving as chief of the castings branch, Iron and Steel Division, Business & Defense Services Administration, Department of Commerce, Washington. In that capacity, he explained BDSA's work as a liaison between foundrymen and the government.—*Robert M. Love.*

Chicago: Three roundtable sessions featured the regular meeting of the Chicago Chapter, AFS, at the Chicago Bar Association, Dec. 3, with about 225 members and guests attending. Chapter President Robert P. Schauss, Chicago manager, Werner G. Smith Inc., presided.

Don G. Schmidt, metallurgist, H. Kramer & Co., who is director of membership, announced that with a current membership roll of 907, the chapter already has exceeded its target for the year by 20 members. J. C. Mulholland, chief metallurgist, Pettibone Mulliken Corp., announced on behalf of the chapter's entertainment committee that the annual Ladies Night party will be held Feb. 16 at the Knickerbocker Hotel.

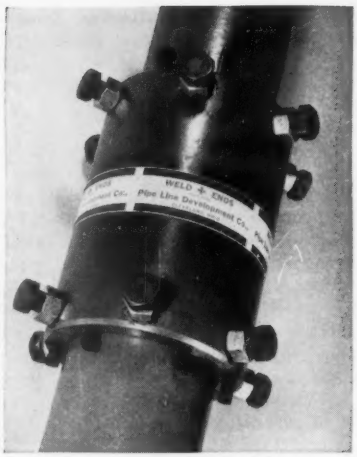
Chapter Vice President W. O. McFatridge, supervisor of foundry laboratory, Manufacturing Research, International Harvester Co., introduced speakers and chairmen for the three roundtables. The Gray Iron and Pattern divisions combined to hear William T. Schmidt, supervisor of patterns and castings, Giddings & Lewis Machine Tool Co., Fond du Lac, Wis., speak on "Lowering Casting Cost and Taking Guesswork Out of Pattern Design."

R. H. Greenlee, plant superintendent, Auto Specialties Mfg. Co., St. Joseph, Mich., addressed the Malleable Iron division roundtable on "Control To Eliminate Hot Tears."

Speaker at the joint Nonferrous and Maintenance Engineering divisions roundtable was W. O. Hanson, LaCrosse Works, Allis-Chalmers Mfg. Co. His subject was "Noise, Vibration and Smoke."

Next meeting of the chapter on Jan. 7 will be Management Night. A. L. Boegehold, manager of activities, research staff, General Motors Corp., Detroit, will speak on "Materials in the Automobile of the Future."—*Erle F. Ross*

Philadelphia: "Cupola Practice" as discussed by Howard H. Wilder, manager, engineering sales, Vanadium Corp. of America, Chicago, attracted 150 members and guests of the AFS chapter to the Nov. 9 meeting held at the Engineers Club, Philadelphia. Walter S. Giele, W. S. Giele Co., Lebanon, Pa., chapter chairman, presided and Dr. Arthur E.



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Schuh, U. S. Pipe & Foundry Co., Burlington, N. J., was technical chairman.

Mr. Wilder covered the practical aspects of cupola operation and discussed the following topics in his talk:

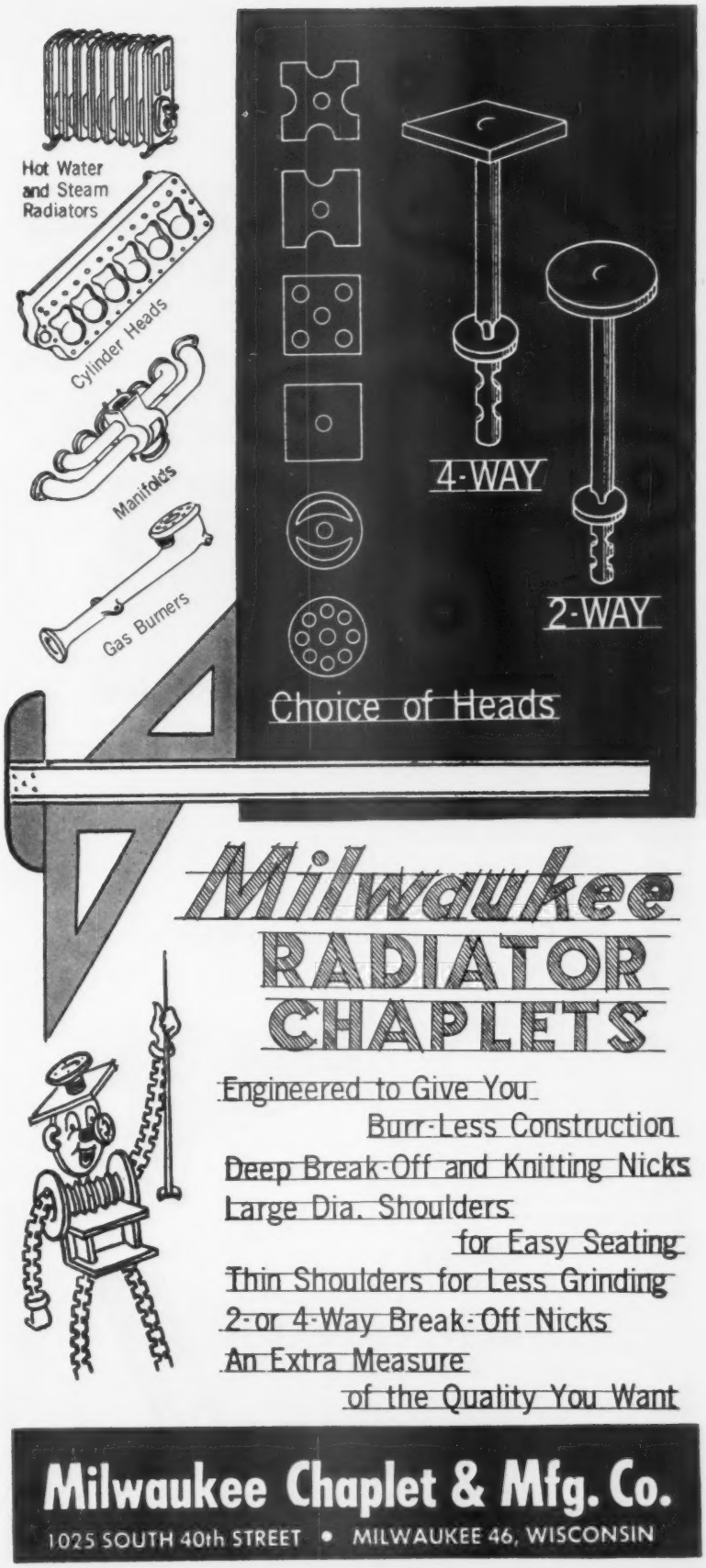
Objectives of the cupola melting process, types of cupolas in operation, cupola charge make-up, molten products of the cupola, sequence of operations in melting practice, bed practice, tuyere sizes and ratios, carbon control and factors which influence carbon pick-up, metal control, alloys or inoculants that are useful tools and slag control.—*E. C. Klank, Philadelphia Coke Co.*

Oregon: Dr. William H. Rice, welding consultant, Electric Steel Foundry Co., Portland, Oreg., addressed the AFS chapter at the Heathman Hotel, Portland, on Nov. 14. He used slides to acquaint his audience with the latest developments and techniques of welding. He discussed methods and materials for welding all classes of castings in all metals and alloys. — *Bill Walkins, Electric Steel Foundry Co.*

New England: The AFS chapter met Nov. 15 at the University Club, Boston, and heard Mac MacPetrie, assistant sales manager, Shell Process Inc., Chicopee, Mass., discuss "Practical Usage of Shell Molding." About 100 members attended the meeting at which Albert M. Nutter, E. L. LeBaron Foundry Co., Brockton, Mass., presided.—*Fred S. Holway, Mystic Iron Works.*

Cleveland Non-Ferrous: Members of the Cleveland Chapter, Non-Ferrous Founders' Society, heard a panel discussion on "Budgeting for Profit" at its Nov. 29 meeting. The panel consisted of U. F. von Rosen, partner, Soloway & von Rosen, society cost consultant; Edward J. Metzger, Multi-Cast Corp., Wauseon, O., national society president, and William A. Gluntz, Gluntz Brass & Aluminum Foundry Co., chairman of the national cost group of the society.

In answering several questions the panel pointed out that budgeting is a financial plan for good business operation. It provides an insight into the future, a means of controlling expenditures and is needed for determining costs and setting a sales price on castings. Good budgeting is based on plant capacity, a normal past operating record, direct labor costs, prospective sales for the next quarter, variable expenses for the



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next six months and fixed expenses for the coming year.

Budgets should be revised as often as business trends indicate, possibly every three to six months. Budgets should be kept up to date because they are important in establishing a pricing formula that permits a profitable operation if government price controls should be put into effect at some time.—*Robert H. Herrmann*

Metropolitan Brass: The Metropolitan Brass Founders Association held its 46th anniversary party at the Brass Rail Restaurant, New York, on Oct. 13. Cocktails, dinner, dancing and the usual fine floor show were enjoyed by 159 members and guests.—*George Staub.*

Wisconsin Conference Planned For Feb. 14-15 at Milwaukee

Twentieth annual Wisconsin Regional Foundry Conference will include a full program of technical papers, in addition to luncheon sessions and a banquet. The two-day meeting will be held at the Hotel Schroeder, Milwaukee, Thursday and Friday, Feb. 14-15. Wisconsin Chapter of the American Foundrymen's Society and the University of Wisconsin are sponsors.

A general session will open the conference on Thursday morning, with five simultaneous technical meetings scheduled for that afternoon and Friday morning and afternoon. The program lists 21 individual technical papers and two luncheon talks. Dr. Ralph E. Lapp, director of Nuclear Science Service, will speak at the banquet on "The World of Tomorrow."

N. N. Amrhein, Federal Malleable Co., is chairman of the Conference Committee. Co-chairmen are L. J. Woehlke, Grede Foundries Inc., and Prof. E. R. Shorey, University of Wisconsin. L. J. Andres, Lawran Foundry Co., is program chairman.

Program details follow:

Thursday, Feb. 14

10 a.m.—Welcoming Addresses: **Engineering, Education and Industry,** Dean Kurt F. Wendt, College of Engineering, University of Wisconsin; **American Foundrymen's Society's Place in the Casting Industry,** Frank W. Shipley, president, AFS; **Report from Our National Office,** William W. Maloney, general manager, AFS.

10:50 a.m.—**Dust and Fume Control,** Harry E. Gravlin, vice president-general manager, Claude B. Schneible Co., Detroit.

12 Noon—Luncheon: **Communist Aggression in Poland,** Charles J. Kersten, attorney, Milwaukee.

2:15 p.m.— Sectional Meetings

Steel: **Can We Make Perfect Castings?** (Sand Angle) John B. Caine, foundry consultant, Wyoming, O.

Gray Iron: **Nodular Iron as Used at Allis-Chalmers,** W. Edens, research supervisor, Allis-Chalmers Mfg. Co., Milwaukee.

Malleable Iron: **Pouring Effect on Scrap,** C. Drury, Central Foundry Division, Danville, Ill.

Nonferrous: **Cleaning Room Problems and Methods Used in the Cleaning Room,** Robert Orth, Wheelabrator Corp., Mishawaka, Ind.

Pattern: **Cast to Size Cast Iron Patterns,** John E. Stock, John Deere Tractor Co., Waterloo, Iowa.

Steel: **Spectrographic Analysis,** L. O. Elkrem, Baird Associates, Cambridge, Mass.

Gray Iron: **Magnetic Particle Inspection as It Applies to Gray Iron Castings,** Arthur Lindgren, Magnaflux Corp., Chicago.

Malleable Iron: **Gating and Risering,** Robert Schauss, Werner G. Smith Inc., Chicago.

Nonferrous: **Gating and Risering Problems Presented by New and Special Alloys in the Foundry,** Dr. George P. Halliwell, H. Kramer & Co., Chicago.

Pattern: **Pattern Research,** David Kindt, Kindt-Collins Co., Cleveland.

6:30 p.m.—Banquet: **The World of Tomorrow,** Dr. Ralph E. Lapp, director of Nuclear Science Service.

Friday, Feb. 15

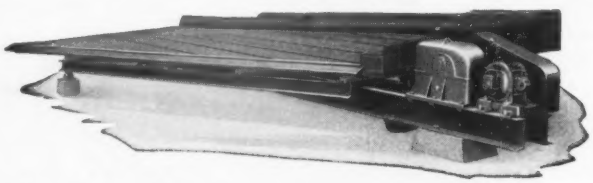
10 a.m.—Sectional Meetings

Steel: **Air Placement of Refractories,** Howard G. Hart, Harbison-Walker Refractories Co., Pittsburgh.

Gray Iron: **Water-Cooled Cupola,** R. J. Aylward and J. Goudzwaard, Neenah Foundry Co., Neenah, Wis.

Malleable Iron: **Shell Cores,** Harry Weaver, Brillion Iron Works Inc., Brillion, Wis.

Nonferrous: **Budgeting for Profit,** Urban F. Von Rosen, Nonferrous Founders' Society, and William A. Gluntz, Gluntz Brass & Aluminum Foundry, Cleveland, NFFS Cost Committee chairman.



Reclaim Non-Ferrous Metallics from Wastes and Residues

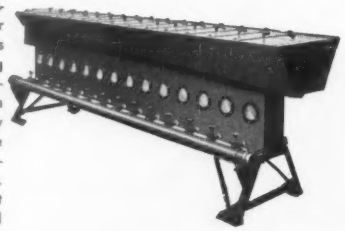
Valuable metallic particles are reclaimed most economically from foundry and machine shop residues by processing on the SuperDuty® No. 6 Table.

This specialized machine, designed for separating materials of differing specific gravities, is so efficient that many concerns have found it profitable to process floor accumulations and old waste piles.

For full information, send for Bulletin 118-B.

For Cleaning and Classifying Used Foundry Sands

The CONCENCO® constriction plate hydraulic classifier cleans used foundry sands while, at the same time, sorting the grains into as many different sizes as there are cells in the classifier. Operation is by hydraulic water only . . . there are no moving parts, regulation is easy and sizing is sharp. Sizes are recombined to meet your sand requirements. Send for full information.



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CONCENCO PRODUCTS

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Step ahead in this five billion dollar market with

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What is PLUS 5? It's your key to more business from foundries. It gives every FOUNDRY advertiser a bonus he can get from no other source. Here is help in analyzing this market—studying sales territories and potentials—planning the sales effort—and creating a constructive promotion program to the 5 billion dollar foundry market. It's time to take a new look at this market—and at the unusual selling aids we have for you. Say PLUS 5 to your FOUNDRY representative and he'll show you this 5-step program designed to move more of your products into foundries

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more than a magazine . . . a complete sales development service

Penton Building, Cleveland 13, Ohio

Pattern: **Mass Plastic Pattern Pouring,** William Weaver, Modern Pattern & Plastic Co.

12 Noon—Luncheon: **How To Keep Your Foot out of Your Mouth,** Edward McFaul.

2:30 p.m.—Sectional Meetings

Steel: **Sodium Hydride and Other Salt Bath Descaling of Steel Castings,** A. F. Holden, A. F. Holden Co., Detroit.

Gray Iron: **Quality Control,** K. MacKay Smith, Quality Control Consultant, Wilmette, Ill.

Malleable Iron: **Hot Cracks,** Richard Heine, University of Wisconsin.

Nonferrous: **Sand Preparation and Handling for Small Foundries,** R. L. McIlvaine, National Engineering Co., Chicago.

Pattern: **Pattern Equipment Necessary for Shell Molding,** John Nieman, Shell Process Inc., Chicopee, Mass.

Chicago Gray Iron Management Group Elects New Officers

Walden G. Greenlee, president, Greenlee Foundry Co., is the new chairman of the Chicago Area Management Group of the Gray Iron Founders' Society. He succeeds Chester R. Lindgren, president, Lindgren Foundry Co., Batavia, Ill.

New vice chairman is W. P. Wright, assistant sales manager and production manager, Hansell-Elcock Co. Re-elected secretary is C. V. Adams, secretary, Vulcan Iron Works Inc.

These officers for the coming year were named at the group's quarterly meeting at the Graemere Hotel.

Mr. Greenlee, who presided in the absence of Retiring Chairman Lindgren, introduced Dr. Robert F. Pearse of Worthington Associates Inc., industrial analysis consultants, who spoke on "Executive Personality and Executive Performance."

Dr. Pearse explained that his organization observes over-all personality performance rather than aptitudes of individuals. In a sense, personality performance is the way an individual expresses himself. A lot of things in a person's life are influenced by social standards, he asserted.

Next meeting of the group will be held Feb. 19. Following a visit to the T. L. Arzt Foundry Co. in the morning, a business session will be conducted at lunch at the Dania Society of Chicago, 1651 N. Kedzie Ave.

Foundries Offer Scholarship

Belle City Malleable Iron Co. and the Racine Steel Castings Co., Racine, Wis., have established an annual scholarship program for the son of an hourly employee of either firm who enrolls in the industrial technician course of the mechanical engineering program at the Milwaukee School of Engineering. The student selected will receive a tuition award of $500 for the two-academic-year (18 months) duration of the course.

MEASURE HEAT ACCURATELY with

the improved

PYRO OPTICAL PYROMETER

The only self-contained direct-reading optical pyrometer for quick temperature measurements of molten iron, steel, monel, etc.

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PYRO SURFACE PYROMETER

Rugged, easy to read. Ideal for shell molding, core oven, mold and die surface temperature measurements.

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BERGENFIELD 6, NEW JERSEY

The Shakeout

Coating Prevents Corrosion of Aluminum

AN ALUMINUM ALLOY BASE material panel withstood 2000 hours of continuous salt spray without evidence of base metal attack or related signs of failure, according to Grand Rapids Testing & Research Laboratories, Grand Rapids, Mich. The panel was treated with a coating of Selinizing Fluid, a silicone resin dispersion in compatible organic solvent produced by Selinized Process Co., Grand Rapids.

The fluid was sprayed on, allowed to air dry, then baked for 1 hour at 480° F before being tested. The resulting coating was 0.2 of 1 mil (0.0002 in.) thick and showed no loss of adhesion during the 2000 hours of testing. It has been applied successfully to a wide range of cast and wrought engineering materials at baking temperatures as low as 250° F. The coating is described by the laboratory as a "hard, durable, tightly adherent yet flexible transparent film."

For More Details Circle No. 478—Page 203

Aluminum Insulation Solves Heating Problems

EFFECTIVE INSULATION is the answer to the problems of keeping heat inside during the winter and reducing solar heat during the summer. At the plant shown, Alfol aluminum foil insulation is said to permit

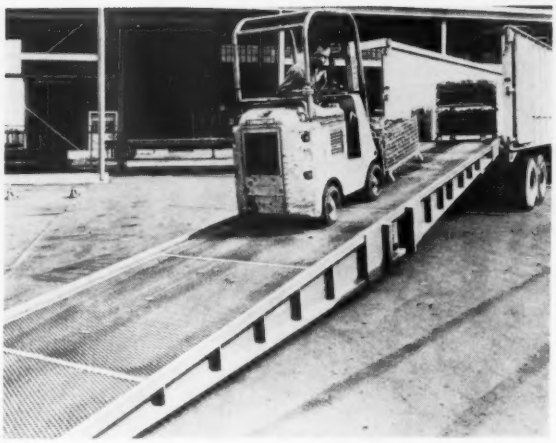
savings of at least 30 per cent on winter fuel costs and keep the production area 10 to 15 degrees cooler during hot weather.

Manufactured by Reflectal Corp., subsidiary of Borg-Warner Corp., Chicago, Alfol insulation consists of multiple layers of aluminum foil. After application, the layers automatically separate themselves about 1 in., with captive air spaces between adjacent layers. The bottom foil layer is laminated to a heavy, waterproof duplex backing that prevents ripping and sagging and provides an efficient vapor barrier. It comes in rolls of 250 and 500 sq ft in various widths. The material can be attached to wood furring, joists, ceiling beams or purlins.

For More Details Circle No. 479—Page 203

Portable Magnesium Ramp Reduces Handling

UNLOADING TIME for incoming castings has been cut 80 per cent at Warren Webster Co., Camden, N. J., through use of a portable magnesium Yard Ramp manufactured by Magnesium Co. of America, East Chicago,



Ind. Incoming trailers are spotted immediately adjacent to the ground-level scale and storage area, and the lightweight, wheeled ramp is moved into position by one man. A lift truck carries pallets of castings from the trailer bed directly to the scale in one operation. The previous system required moving the castings from trailer to dock, down an elevator to ground level and then through almost 1500 ft of aisles.

For More Details Circle No. 480—Page 203

Wirebound Pallet Bins Simplify Ingot Handling

MANUAL HANDLING of nonferrous ingots has been virtually eliminated at the plant of W. J. Bullock Inc., Birmingham smelter, and at those of its customers. Ingots are packed and transported in 40-lb wirebound

pallet bins which contain 2200 lb of ingots. The containers can be stacked up to three high.

The accompanying photo shows a customer's truck being loaded. The heavily packed containers are placed precisely to assure even weight distribution. For shipment by a common carrier, lids are fastened as protection against pilfering and mixing of alloys of different compositions. The pallet bins are designed to be returned for reuse when shipped by private carrier.

For More Details Circle No. 481—Page 203

EUCLID CRANES

carry their share *of the Production Load in*

FOUNDRIES EVERYWHERE

This 10 ton, 3 motor EUCLID CRANE is in operation at TEXAS ELECTRIC STEEL CASTING COMPANY.

Some of the Many Foundries utilizing Euclid Cranes . . .

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Kasper Foundry
Duplex Foundry
Larson Foundry
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Euclid cranes in a wide variety of types and capacities are well established in many foundries.

Long periods of dependable, trouble-free service constitute their strongest recommendation.

Precision load control with dirt and dust free mechanism make them highly regarded.

Push-button or Rope Pendant floor control as well as overhead cab operation is available.

We can build any foundry crane required. A phone call or letter will put our services at your disposal.

THE EUCLID CRANE & HOIST CO.
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Circle 746 on Inquiry Card—Page 203

GLUTRIN
LIQUID BINDER

GOULAC
DRY BINDER

For
CORE WORK, SAND FACINGS, SPRAYS

Write for pamphlets giving detailed information. Both materials carried in stock by America's foremost foundry jobbers

Robeson Process Company
(Established 1905)

American Gum Products Co.
(Established 1915)

GENERAL OFFICES AND PLANT: • ERIE, PA.

Circle 747 on Inquiry Card—Page 203

INCREASE PRODUCTION with the MURPHY PISTOL SPRAYER

$17.25
1/16" to ¼" pipe size
Any length nozzle desired

A squeeze of the trigger and the Murphy Pistol Sprayer instantly shoots a stream of blackening into inner pockets that could never be reached by old-fashioned brush or swab method. Designed by a foundryman, the Murphy Pistol Sprayer is ideal for cleaning permanent molds—aluminum and other metal, and for sand blasting.

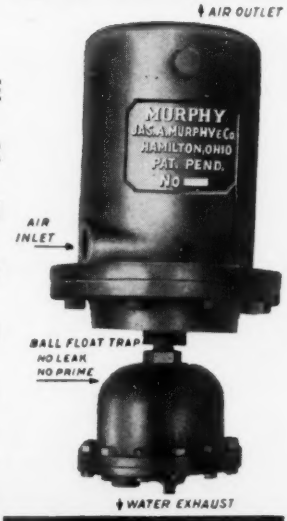
Pipe size	1/16"	⅛"	¼"	⅜"	½"
Price F.O.B. Hamilton, O.	$17.25	$17.25	$17.25	$20.15	$25.30

Prices complete with 5 ft suction hose

EXTRA LONG NOZZLES FOR ⅜" SIZE
This size Sprayer can be furnished with nozzles up to 48" long for spraying ingot molds and hard to reach places . . . also available with curved nozzles up to 15" long.
Long Nozzle Sprayer $25.30

COMPLETE WATER ELIMINATION GUARANTEED WITH MURPHY COMPRESSED AIR EQUIPMENT

Shown here is a type B Automatic Separator guaranteed to remove all of the moisture and 90% of the oil from compressed air lines.



We manufacture an extensive line of Aftercoolers (Vertical and Horizontal). Separators ½" to 6". Aftercoolers 50 cfm. to 10,000 cfm. Traps, (Air and Oil)

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AFTERCOOLERS
SEPARATORS
STRAINERS
TRAPS
SPRAY GUNS
PISTOL SPRAYERS

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Are You Looking for

- Machineability?
- Chemical inertness?
- High thermal conductivity?
- High temperature stability?
- Resistance to thermal shock?

. . . then consider GRAPHITE — it has many unique qualities.

We are specialists in graphite specialties. Our technicians will be glad to work with yours.

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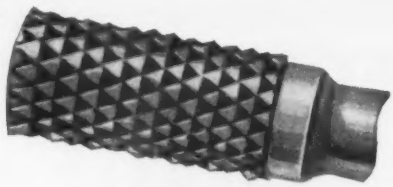

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Stock Tools:

Burrs—Carbide • Drills—Solid Carbide and Tipped • Internal Grinding Burrs—Solid Carbide • Reamers and End Mills—Solid Carbide and Tipped • Slitting Saws—Solid Carbide • Rotary Files H.S.S.—Hand cut and ground from the Solid

Specials:

In addition to the foregoing, ESSEX maintains a special tool designing department and can supply the following in Solid Carbide and Carbide-Tipped Tools:
Tipped Tools • Counterbores • Step-Drills • Twist-Drills • Dies • Grooving and Milling Cutters • Key Cutters • T-Slot Cutters • Router • Bits • Profiling Cutters, Etc. to sketch or blueprint.
Complete resharpening and reconditioning, service available.

Areas available for distributors inquiries invited.

Makers of Fine Tools Since 1868

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Circle 728 on Inquiry Card—Page 203

Circle 729 on Inquiry Card—Page 203

Imported from Germany, specifically designed to cut filing and grinding costs . . .

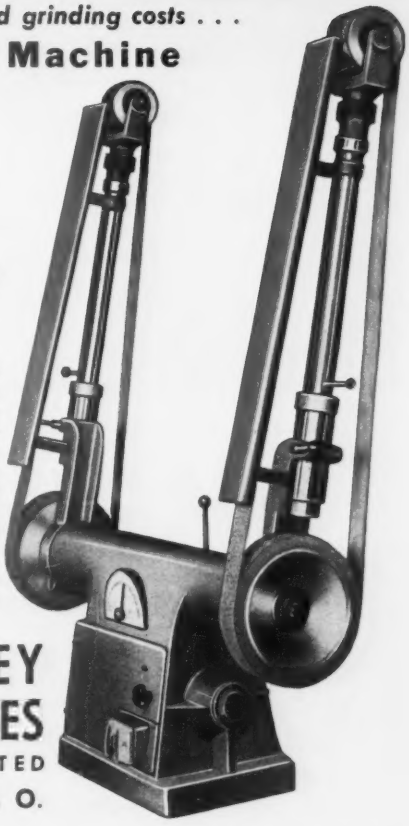
Filing Machine and Band Grinding Machine

featuring

INFINITELY VARIABLE SPEED TRANSMISSION

★

The filing machine at left is an efficient and economical tool for roughing and smoothing any type of casting, iron, steel, or nonferrous. The band grinding machine at right grinds and polishes by means of contact discs and grinding bands. Both machines have infinitely variable speed transmission. This is an import deal. Ask us about it.



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A COMPLETE FOUNDRY SERVICE

CONSULTANTS

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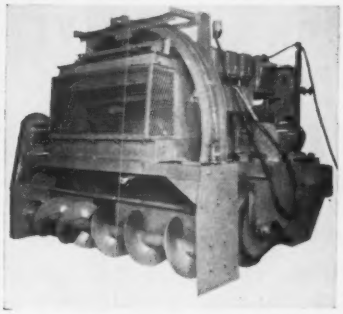
RINGLIFT SAND CONDITIONER



Self-propelled, self-loading, rugged. Liftring utilizes centrifugal force to elevate up to one ton per minute. Larger magnet, correctly applied, does near-perfect separation job.

Mixes, adds water, cools hottest sand by vigorous aeration. 75" headroom, 63" turning radius, straddles windrows. Lowest maintenance.

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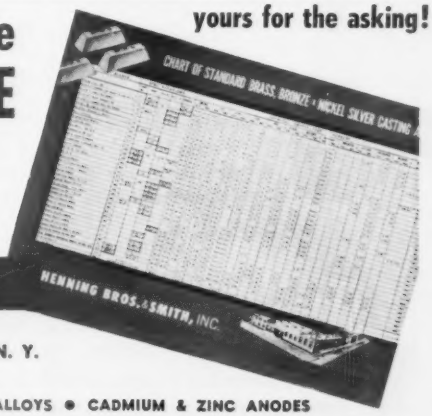
send for this valuable quick-reference 17" x 22" standard alloy wall chart FREE

yours for the asking!

This see-at-a-glance wall chart will save you hours of time in making up your specs. Chart shows all types of customer specifications: Navy, S.A.E., A.S.T.M., and Federal. It shows chemical composition, by percentages, of 37 alloys. Write today for your copy to:



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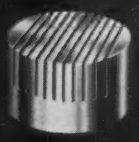
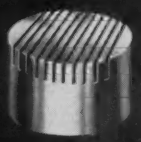
SLOTTED CORE BOX VENTS

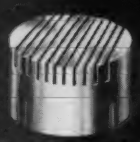


X-TRA DEEP HEAD .156 Wide Slots .014

SHALLOW HEAD .031 Wide or Narrow Slots .014 .010



DEEP HEAD .093 Wide or Narrow Slots .014 .010



CO_2 TYPE DEEP HEAD .093 Wide or Narrow .014 Slots .010

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INSERTING DRILL

- MOST ECONOMICAL METHOD for INSERTING CORE VENTS
- CORRECT DEPTH
- UNIFORMITY OF HOLES
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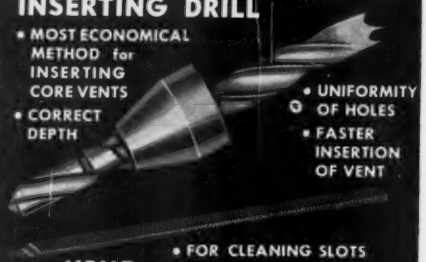

VENT CLEANER
- FOR CLEANING SLOTS
- MADE OF TEMPERED STEEL
- EASY TO USE

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HIGH SILICA QUARTZITE PEBBLES

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Circle 737 on Inquiry Card—Page 203

GLOSSARY OF FOUNDRY TERMS

Compiled by Ed Bremer, FOUNDRY Metallurgical Editor

This extensive glossary of foundry terms was compiled from a wide variety of sources. Arranged in handy booklet form, it is a valuable reference for every foundryman. 48 pages.

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You'll get more production with these faster, more powerful rammers and at the same time substantially reduce maintenance costs.

The Valve Units will last for years. The Cylinder Bores and Piston Rods are HARD CHROME PLATED which doubles the life of the Rammer. Many of the largest foundries in the country have already adopted them as standard. Made in six sizes to meet every requirement.

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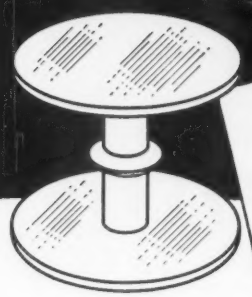
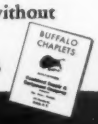


Buffalo CHAPLETS

Exclusive fin design of both Double and Single Head types assures positive fusion with molten metal. No recess in stem to weaken structure. Leakage problem is ruled out. Burns in more easily. Does not chill molten metal.

In addition, extensive variety of other types to meet your needs exactly. Since 1912, serving the nation's leading foundries. Trial samples without charge.



Complete information in Catalog No. 16

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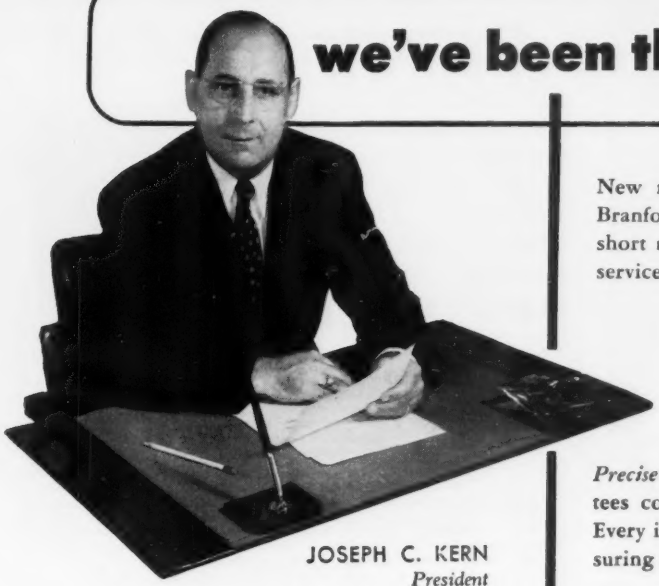
we've been thinking about YOU



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President

New management has reorganized the 40-year-old Branford Company *with you in mind.* In the twelve short months we've been here, we've improved your service in three important ways.

Quick Service—Branford products are now shipped right from stock . . . on their way within hours after the order reaches us. And more Branford distributors stock more Branford products than ever before.

Precise Quality Control—New "watchdog" care guarantees consistent high quality with Branford products. Every item manufactured is individually inspected, assuring complete reliability when it reaches you.

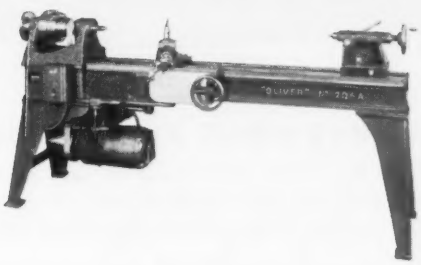
Know How—Still greater experience and skill add an important new measure of leadership in research and product development at Branford. Completely new products as well as improvements on our regular line are constantly under study.

Write today for your Branford catalog and the name of your nearest Branford distributor.

THE
Branford
COMPANY
131 CHESTNUT STREET • NEW HAVEN, CONN.

Circle 739 on Inquiry Card—Page 203

Turn large patterns faster, more accurately with this new OLIVER LATHE



The Oliver No. 20 Woodturning Lathe is one of a complete line for pattern shops. It embodies the latest engineering developments and is available in four sizes to swing 16", 20", 24" and 30" over bed. Standard beds are 8' and 10' long—longer beds furnished as an extra. The regular machines have 8 spindle speeds—16 speeds available on special order. Oliver Lathes are used in leading pattern shops through the world. Write for Bulletin No. 20.

Oliver makes a full line of lathes and woodworking machinery for pattern shops

OLIVER MACHINERY COMPANY
Established 1890 **GRAND RAPIDS 2, MICHIGAN**

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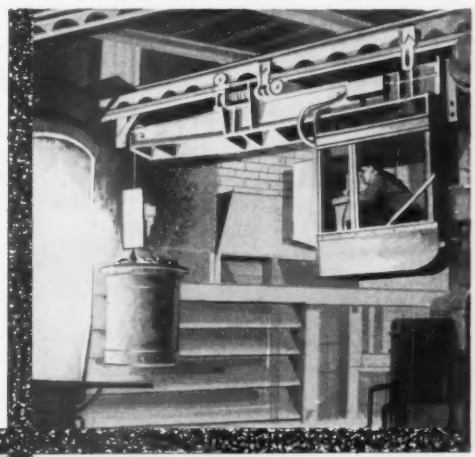

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COMMERCIAL CONTRACTING CORPORATION

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Commercial Contracting Corporation has installed or modernized foundries for all the major automotive producers. Utilize this experience to up-date your own foundry facilities.

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Circle 741 on Inquiry Card—Page 203

Zircon Sand

Zircon Flour

Silica

BERKSHIRE

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Potassium Titanium Fluoride

Potassium Zirconium Fluoride

BERKSHIRE CHEMICALS, INC.

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Circle 742 on Inquiry Card—Page 203

CENTRIFUGALLY CAST

AUTOMOBILE CYLINDER LINERS

DIESEL ENGINE LINERS

BRONZE BUSHINGS

on the new **WATER-COOLED Model M-WC**

(Illustrated)

Utilizes low cost permanent molds of available steel tubing to produce gray machinable cast iron or bronze bushings. Water cooled molds can be maintained at either high or low temperature easily. High or limited production in very small space with unskilled labor. Completely safe for workmen. Simple, sturdy equipment. Quick changeover from one mold to another. Practically 100% metal yield of high quality, denser castings. Metal porosity eliminated.

Write for new Bulletin # 153 Illustrating Model M-WC

RESEARCH FACILITIES

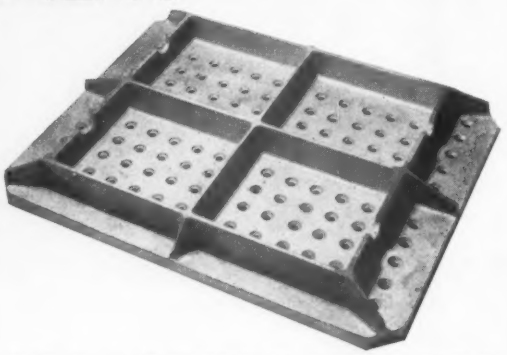
We have available an Experimental Foundry equipped for ferrous and non-ferrous melting for both vertical and horizontal centrifugal casting production. Our facilities are available to foundries for research or trial centrifugal castings at low cost.

Centrifugal Casting Machine Co.

P. O. Box 947 Tulsa 1, Okla.

Circle 744 on Inquiry Card—Page 203

NEW ALUMINUM BOTTOM BOARDS



CUT FOUNDRY COSTS

- Will not warp or burn
- Give long lived service
- Eliminate repairs
- Assure uniform molds each cast
- Not affected by weather
- Eliminate stacking problem
- Raised sand strip (optional) around outer edge peens each mold uniformly and eliminates sand slippage
- Rib reinforced for added strength and durability
- Completely cast of aluminum with vent holes on face to permit gas escapement
- Insures better molds at less cost
- Can be furnished with or without sand strip

Write for prices on standard sizes

JO-EL COMPANY

14209 Leroy Ave., Cleveland, Ohio

Phone ORchard 1-5787

Circle 743 on Inquiry Card—Page 203

Master Power

HARD CHROMED • PORTABLE PNEUMATIC TOOLS

DO MORE WORK AT LESS COST

because they deliver more power per cubic foot of air consumed, are light in weight for easier maneuverability and they retain their new tool power longer.

ARE PREFERRED BY OPERATORS

because they are lighter in weight, better balanced and designed to reduce shock and be free from vibration.

IF YOUR PROBLEM INCLUDES

chipping, ramming, grinding, buffing, sanding or wire brushing, *write us today for full particulars.*

THE MASTER PNEUMATIC TOOL COMPANY, INC.

ORWELL, OHIO • U. S. A.

SALES • SERVICE • STOCK • COAST TO COAST

Circle 745 on Inquiry Card—Page 203

CLASSIFIED ADVERTISING

Help Wanted

FOUNDRY TECHNICIAN OR QUALITY CONTROL ENGINEERING ASSISTANT

Mechanized gray iron foundry in Ohio producing quality engineering jobbing castings. Applicant should have some technical background, training or experience in one or more of the following fields—Metallurgy, Cupola Control, Sand Control, Gating and Risering.
This position will offer many opportunities in increasing efficiency and control of all foundry operations including practical research, development and application on new foundry processes such as shell process and CO_2 process. Earnings will be dependent on qualifications and ability.

BOX 399, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

MELTING SUPERINTENDENT

Large modern Northern California jobbing foundry has opening for experienced melting superintendent. Must have experience in either electric steel melting, electric iron and malleable melting or both. Should have either college training with 5 years' experience or high school education with equivalent experience. Will supervise five melting foremen. Excellent opportunity with good future. Salary open. Send work experience resume.

BOX 422, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

COREROOM SUPERINTENDENT

Midwest foundry, very active in intricate core work including dry sand assemblies, desires person with experience, drive and ability to achieve those results necessary in a highly efficient and well operated core department. Salary commensurate with ability of the applicant.

BOX 421, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

FOUNDRY SUPERINTENDENT

Opening available at a cast iron sanitary plumbing fixtures plant for a man with extensive experience and thorough knowledge of all phases of gray iron foundry and enameling operations. Must be capable of obtaining first class production results and willing to relocate near Montreal, Canada. Send experience record, personal data, recent photo and references. Address: Box 401, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

GRAY IRON FOREMAN

Small gray iron foundry in midwest needs a general foreman to take complete charge of operations. Must be experienced in floor work as well as squeezer and large machine production. In reply give age, experience and references. Address: Box 403, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRYMAN

Real opportunity exists for responsible man with practical foundry experience, free to travel, demonstrating new foundry process. Liberal salary and expenses with excellent future. Address: CARVER FOUNDRY PRODUCTS, MUSCATINE, IOWA.

PERMANENT MOLD DESIGN ENGINEER

Must be capable of heading up department as well as designing molds. Address: HAMPDEN BRASS & ALUMINUM CO., 262 LIBERTY ST., SPRINGFIELD 1, MASS.

Help Wanted

WANTED

MOLDING FOREMAN

for

DUCTILE IRON PRODUCTION

Address qualifications to:

NEENAH FOUNDRY COMPANY

NEENAH, WISCONSIN

METALLURGIST

Large jobbing Gray Iron Foundry in Milwaukee-Chicago area wants metallurgist capable of supervising operation of cupola making up to ASTM Class 50 Irons. Send resume of education, experience and salary requirements.

BOX 415, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

FOUNDRY SUPERINTENDENT

An Eastern malleable iron foundry is interested in employing a foundry superintendent with knowledge of all phases of foundry operations. Please forward resume of qualifications, experience, reference and salary requirements.

BOX 417 FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

METALLURGICAL ENGINEER

For unusually interesting combination of customer service and lab work on metallurgical additive widely used in foundries and steel plants. Requires training in ferrous metallurgy; some experience in gray iron melting desirable, or familiarity with open hearth practice. Work will include both field trips to supervise additive tests and direction of lab work to obtain physical data for customers and sales literature. Write to: Howard C. Pilkey, Manager, Salaried Personnel, THE CARBORUNDUM COMPANY, NIAGARA FALLS, NEW YORK.

FOUNDRY FOREMAN

Experienced, practical foundryman, preferably with knowledge of sanitary plumbing fixture line, good at training and handling of employees, excellent in scrap control, wanted by foundry near Montreal, Canada. Write full particulars. Address: Box 402, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MAINTENANCE ENGINEER

For Northern Ohio Iron and Steel Foundry employing 200 men, jobbing foundry. Familiar with furnace, Morgan cranes, plant layout and production. Send complete resume including age, weight, height, experience, salary desired, references, etc. Address: Box 374, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

METALLURGIST

Well established midwest malleable iron foundry seeks experienced metallurgist. Excellent opportunity. Submit resume of education, experience and state salary requirements. Address: Box 400, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Help Wanted

DEVELOPMENT METALLURGIST

For alloy development projects in the production of cast irons and cast or wrought nonferrous products. Engineering degree and five or more years' practical experience with operating equipment and processes. Capable to conduct systematic and constructive metallurgical investigations in melting, alloying and casting. Fine opportunity for seriously interested young metallurgist to gain valuable experience and to qualify for future promotion in progressive, nationally known corporation. Confidential.

BOX 369, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

DESIGNERS-DRAFTSMEN-ENGINEERS

Experienced in foundry layouts and equipment. Send experience record, personal data, recent photo and reference prior to personal interview.

BOX 361, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

METALLURGIST

Well established malleable iron foundry in the East seeks experienced metallurgist. Please submit resume of qualifications and experience, references and salary expected.

BOX 418, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

ASSISTANT FOUNDRY MANAGER

Expanding Eastern foundry with modern management perspectives has immediate need for an individual who possesses the following qualifications: Under 45 years of age, college degree in metallurgical, mechanical or chemical engineering or equivalent practical experience in foundry. Familiar with all phases of gray iron manufacture including core room, cupola, sand preparation, molding and cleaning practice. We feel we have a wonderful opportunity to offer an individual who would enjoy putting his ideas into practice in a plant enjoying good union relations. Our avenues for improvement are many and the trait of aggressiveness will be appreciated. Write in confidence giving complete resume including availability and salary requirements. Address: Box 408, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT

Want capable gray iron foundryman with understanding of iron, sand and molding; machine and floor type work. Should possess good supervisory qualities. Give age, complete job history and salary expected. All replies confidential. Address: Box 396, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

METALLURGIST

Familiar with secondary aluminum smelting practice to consult primarily by phone and mail with midwestern sand and permanent mold foundry. Will not interfere with present occupation. State qualifications. Replies confidential. Address: Box 423, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

GRAY IRON FOREMAN

Gray iron jobbing foundry near Cleveland needs a dry sand foreman for medium and large floor work. In reply give age, experience, references and include photograph. Address: Box 366, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

METALLURGIST

To take complete charge of bronze foundry. Must be experienced in producing castings in all sizes and all alloys. Salary open; excellent opportunity for progressive person. New Jersey metropolitan area. Address: Box 416, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

LAYOUT MAN

For metal pattern shop. Paid vacations and holidays. Steady employment. PROCESS PATTERN & ENGINEERING CO., INC., 1707 N. HARRISON ST., FORT WAYNE, INDIANA.

CLASSIFIED ADVERTISING

Positions Wanted

SUPERINTENDENT
Practical gray iron foundryman, technically trained, graduate metallurgist with 26 years' background of experience in jobbing and highly mechanized production foundries. Castings to 15 tons. Well versed in all phases metal and sand control, molding, rigging, gating and risering, costs, etc. at minimum scrap costs. Have the ability and know-how to get results. Address: Box 409, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MANAGER
SUPERINTENDENT OR SALES
Thoroughly experienced foundryman, gray, semi-steel, alloyed and ductile iron. Jobbing or production. Ability to handle any position. Age 45. Relocate. Available soon. Address: Box 354, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRYMAN
Thirty years' practical technical experience on ferrous and nonferrous. Good trouble shooter. Desire position with aggressive company. Will relocate. Address: Box 414, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

CORE ROOM FOREMAN
Ten years' experience as foreman on medium and heavy jobbing, gray iron and steel. Desire job with future, married, age 38. Address: Box 377, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOREMAN
Thorough knowledge of all phases of nonferrous metals. Green sand, skin dry or French sand, and tablet or false core molding. Thirty years' experience. Desire to make change. Address: Box 343, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

WORKS MANAGER-SUPERINTENDENT
Capable of operating a 350 man organization. 23 years of experience in casting ferrous and nonferrous metals in sand, permanent and investment molds profitably. Address: Box 398, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT
Practical, technical background. Light and heavy, green and dry sand. Cupola operation, cost conscious, jobbing and captive. Last place 18 years, foundry superintendent, technical foundry advisor, liaison man between machine, pattern shop and casting buyer. Address: Box 420, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT
Thoroughly versed in all phases of ferrous and nonferrous foundry operations. Capable of producing efficiently and profitably. Address: Box 312, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MANAGEMENT OR SALES
Energetic young M.E. with production and technical experience in high production and job shop foundry operations, shell molding, plant and equipment engineering, desires a position with opportunity. Prefer midwestern location. Resume upon request. Address: Box 405, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MANAGER-SUPERINTENDENT
Progressive, practical and technically trained foundryman, 45 years of age. Well versed in all phases of light to extra heavy ferrous jobbing work. Cost and control minded. Very good labor relations. Now employed. Address: Box 355, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

STEEL CASTINGS SALESMAN
Experienced selling carbon, alloy, stainless castings, N.J., N.Y., New England. Young, aggressive, personable, hard worker. Consider related fields. Address: Box 425, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT OR MANAGER
Progressive foundryman familiar with every phase of practical experience on all classes of work. Now employed. Would like to make change. Address: Box 426, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRYMAN
Gray iron or nonferrous. Familiar with every phase of the foundry, background of practical and technical experience. Now employed as superintendent. Address: Box 419, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Employment Service

FOUNDRY PERSONNEL SPECIALISTS

National Placement and Procurement of

GENERAL AND PLANT MANAGERS, PLANT SUPERINTENDENTS, FOREMEN—ALL DEPARTMENTS, METALLURGISTS, ENGINEERS, CONTROLLERS, ACCOUNTANTS, SALESMEN, SALES MANAGERS, PERSONNEL DIRECTORS, PURCHASING AGENTS

Confidential Inquiries Invited
From Employers and Qualified Applicants.

For Fast Competent Assistance Contact

DRAKE PERSONNEL, INC. — **HARRISON 7-8600**
JOHN COPE, DIRECTOR — **220 SOUTH STATE ST., CHICAGO, ILL.**

SALARIED PERSONNEL
$5000-$30,000. This reliable service established 1927, conducts confidential negotiations for high grade men who seek a change of connection under conditions assuring if employed full protection to present position. Send name and address only for details. Personal consultation invited. Address: JIRA THAYER JENNINGS, P.O. BOX 674, MANCHESTER, VERMONT.

Representatives Wanted

REPRESENTATIVES WANTED
We are changing our sales policy and are interested in discussing the sales of our melting furnace equipment with representatives in various districts outside of New York and Chicago. We manufacture a complete line of gas and oil non-ferrous melting furnaces in all sizes and types.
Also interested in a salesman for our home office.
STROMAN FURNACE AND ENGINEERING COMPANY
9900 FRANKLIN AVENUE
FRANKLIN PARK, ILLINOIS

REPRESENTATIVES WANTED
Manufacturers' Representatives or Dealers wanted. Territories now available for Reda Melting Furnace designed for ferrous or nonferrous metals. Aggressive selling outlets calling on foundries desired who want to handle profit making furnace on a commission basis. Write or call: FURNACE DIVISION, REDA PUMP COMPANY, BARTLESVILLE, OKLAHOMA.

SALES REPRESENTATIVES
To handle foundry account selling copper, brass, bronze, aluminum and zinc alloy sand castings. Ohio and midwest territories open. Strictly commission but liberal if results good. Address: Box 360, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

CASTINGS SALESMAN
Experienced man under 40 years of age preferred. Salary and expenses. Chicago and some travel. Excellent opportunity for right man with old established steel foundry. Address: Box 413, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SALES REPRESENTATIVES
Gray iron production castings, Pennsylvania, Ohio, Maryland, New York, Connecticut areas. Address: Box 395, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

REPRESENTATIVE WANTED
Manufacturer's agent to sell quality gray iron castings. Address: Box 412, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SALESMAN
Established gray iron foundry is expanding sales force. Seeks a man between ages 28 and 40 with some gray iron sales experience. He will operate out of Cleveland. Should have car. Send complete resume and photograph. Address: Box 424, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Opportunity

PERMANENT MOLD METHOD AVAILABLE
THE WAGNER PERMANENT MOLD CO., 2910 Empire Ave., Burbank, California, has developed a Permanent Mold Method for ferrous and nonferrous metals and invites inquiries from any country regarding this method and process.

Open Capacity

OPEN CAPACITY
We have open capacity and solicit your inquiries for gray iron castings, ranging in weight from 500 pounds to 15,000 pounds. Quality castings produced under close metallurgical control. Address: Box 411, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Representative Available

REPRESENTATIVE AVAILABLE
Established industrial sales agency seeks representation in New York and northwest Pennsylvania for aluminum and bronze foundry. Address: Box 406, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Foundries For Sale

FOUNDRY FOR SALE
Highly rated concern, established 26 years, operating one foundry and taking complete output of two others for sale. Making waterworks fittings and shipping nationally. Profit over one hundred thousand annually and expanding. Six acres of land and over 200,000 square feet of brick and steel buildings. Owner wishes more leisure time but will stay on until relieved. Price $400,000, with about one-fourth cash or will consider part investment and balance on contract over ten years. Low labor cost and no labor trouble. Located city of ten thousand in Southern Indiana. Zoned out of city limits for low taxes.
BOX 410, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

FOR SALE
Magnesium Foundry
St. Louis Area
For details write to:
MORAN & CO.
10 Commerce Court, Newark, N. J.
or phone: MArket 3-1626
N. Y. phone: BOwling Green 9-3897

SMALL FOUNDRY FOR SALE
Well equipped brass and aluminum foundry. Building 21' x 35' including furnace room, concrete block. Ample room for expansion. Will include 2 bedroom house and garage on same lot in good condition at a very reasonable price. Retiring, reason for selling. Address: ALUMINUM CASTINGS CO., 1006 TEMPLE TERRACE HWY. TAMPA 4, FLORIDA.

FOUNDRY FOR SALE
Rio de Janeiro, Brazil
Complete, well equipped, on its own land, producing iron, alloy iron, steel castings, manufacturing A. S. A. valves for petroleum industry. Assets—$400,000. $250,000 will acquire control. Write for details. Address: Box 407, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

GRAY IRON, BRASS, AND ALUMINUM
Small foundry located in fast growing market. Six ton daily capacity. Modern Equipment. Can be financed. Address: CLEMMONS MANAGEMENT, 4108 DENNIS, HOUSTON 4, TEXAS, PHONE CAPITAL 3-4527.

FOUNDRY FOR SALE
Brass foundry, well equipped, for sale or lease. Competition—one non-captive foundry. Address: S. J. STEWART, 527 ST. JOSEPH ST., NEW ORLEANS 12, LA.

CLASSIFIED ADVERTISING

Foundries Wanted

WANTED

Gray iron foundry located in Eastern Pennsylvania and presently operating.

BOX 379, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

WANT TO BUY

Interested in buying a small to medium-size foundry producing Niresist, Nihard and similar heat, corrosion and abrasion resistant castings. Please submit complete details in first letter in strict confidence. Address: Box 390, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Wanted-To-Buy

WANTED

Osborn Roto-Lift Molding Machine Model No. 3161

PEORIA MALLEABLE CASTINGS CO.
PEORIA, ILLINOIS
PHONE: 2-5401

W A N T E D

Centrifugal casting machine for red alloys. Must have mold equipment up to 16" diameter. Give full details in first letter.

BOX 404, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

MULLER WANTED

Simpson #2 or Clearfield #610 or equivalent. State age, condition and price. Address: DANVILLE FOUNDRY CORP., P.O. BOX 119, DANVILLE, PENNSYLVANIA.

MIXERS WANTED

Used Simpson Intensive Sand Mixers. State size, condition and lowest cash price or immediate acceptance. Address: Box 578, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

WANTED TO BUY

Gas fired annealing furnace, approximately 15′ x 7′ x 7′. State size, condition, lowest cash price and delivery. Address: EX-CELL-O CORP. OF CANADA, LTD., 120 WESTON STREET, LONDON, CANADA.

For Sale

$100,000.00 WHEELABRATOR
SEALED BID SALE

Because of the tremendous response to our Sealed Bid Sale of Nov. 15th. We are offering another sale of good used Sand Blast Equipment (Wheelabrators, Tumble Barrels, Table Blast, Dust Collectors, Pressure Tanks, Vapor Blast and many types and sizes) to the highest Bidder, Febr. 5th. Sealed Bids must be in by Febr. 4th. No Deposit necessary at time of offering. Subject to owners approval. If interested please request listings.

We will buy one piece or your entire plant.

DIAMOND SALES, INC.
5654 W. JEFFERSON DETROIT 9, MICH.
VI 36750

FOR SALE

MOTORS—GENERATORS
TRANSFORMERS
Unused — Rebuilt

WORLD'S LARGEST INVENTORY

ELECTRIC EQUIPMENT COMPANY
Phone Station Collect GLenwood 3-6783
P.O. Box 51—Rochester 1, New York

For Sale

GUARANTEED
MACHINES
AT LOWEST PRICES

MILWAUKEE MODEL 103 10" SQ. 16 x 20; 4½" JOLT DIA. $125.00 EACH

JOLT SQUEEZE
STRIP MOLDING MACHINES
213 SPO; 4½" jolt; 13" squeeze
2114 SPO—11" sq.
2136 SPO—13" sq.
720 U Osborn—11" sq.
International PKL—14 x 5½

JOLT ROLLOVER
MOLDING MACHINES
Tabor—30" x 40"; 12" draw; shockless—1000 # cap.
2047 Osborn; 18" x 24"; stationary
601 Osborn; 30" flask
602 Osborn; 36" flask
605 Osborn; 54" flask

JOLT SQUEEZERS
275 J Osborn; 16 x 20; 10" sq. cyl.
276 J Osborn; 17 x 26; 13" sq. cyl.
113 J SPO; 17 x 26; 13" sq. cyl.

CORE BLOWERS
Redford Core Blowers
#193 Osborn for medium cores
#94 Osborn—for large cores

MATERIAL HANDLING EQUIPMENT
Model HA Hough Payloader
Clark Fork Lift Truck—6000 lb. Gasoline
Clark Fork Lift Truck—5000 lb. Electric—with battery
Elwell Parker Fork Lift Truck—4000 lb. Gasoline
Mercury Fork Lift Truck—2000 lb. Electric
Lewis-Shepard Platform Lift Trucks

FURNACES
2000 lb. Stroman—Tilting Hydraulic
2000 lb. Fisher—Aluminum
350 lb. Detroit Rocker Barrel—Complete

CORE OVENS
Dielectric—Model 900A and 1800A. Set up in your shop in operating condition. Less than one-half price.
Despatch Core Oven—Batch type—8′ square complete with all controls.

MISCELLANEOUS
FOUNDRY EQUIPMENT
Roller conveyor, 3" channel iron; 2½" rolls; 6" on center; ⅛" above rail, 3000 ft.
U.S. 7½ HP 3 speed grinders; 28" wheel
Model S Screenerator—B & P
Climax Wire Straightener
Model AA American Sandcutter
Jib Cranes—2 ton capacity
Electric Hoists—2 ton capacity
#42 Osborn Hand Rollovers

For the Best Deal Call
BALCHER MACHINERY COMPANY
695 E. 152nd STREET CLEVELAND 10, OHIO
TELEPHONE: GLENVILLE 1-2474

FOR SALE

1—Used Model "M" Beardsley & Piper Screenarator in good operating condition. 3 phase, 60 cycle, 220 volt motor. Price $400.00 f.o.b. Little Falls, New Jersey. Also have good stock of new repair parts for this machine which may be purchased. Address: NORTH JERSEY FOUNDRY CO., INC. 453 MAIN STREET, LITTLE FALLS, NEW JERSEY.

FOR SALE

Two cupolas—Nos. 8 and 9 Whiting. No. 8 used less than 13 months and is complete with skip charger, blower and controls. Address: J. R. ANDERSON, TYLER PIPE & FOUNDRY COMPANY, TYLER, TEXAS.

SURPLUS EQUIPMENT

Several Osborn jolt squeeze molding machines #274-J and 275-J. Address: ATLANTA STOVE WORKS, P.O. BOX 54, STATION E, ATLANTA, GEORGIA.

FOR SALE

Room type Pangborn shot blast, 11′ x 10"—7′6" high, with double doors 6′6" high, complete with tank, motor and equipment. Address: COLUMBIANA FOUNDRY COMPANY, COLUMBIANA, OHIO.

FOR SALE

Three special 3,000 pound capacity, geared, covered, and insulated cylindrical ladles. Never used. Priced for quick sale at fraction of cost. Address: J. R. ANDERSON, TYLER PIPE & FOUNDRY COMPANY, TYLER, TEXAS.

For Sale

FOR SALE

MOLDING MACHINES
1—Tabor 22" Power Jolt, Rollover, Draw, Portable, 22" x 32" Table.
1—Milwaukee jolt-squeeze stationary.
2—International Jolt, Rollover Draw, 24" x 10G, Stationary.
2—No. 275 Osborn jolt squeezers. Stationary.
2—SPO Jolt Squeeze strip—13".

BLOWERS FOR CUPOLAS AND FURNACES
1—Connersville Rotary Blower, 6000 CFM.
1—Connersville Rotary Blower, 3500 CFM.
2—#7½ Roots Rotary Blowers—27 x 81—14000 CFM.
2—Connersville Rotary 14" x 27" HD, 2750 CFM at 5# press.
Maxon-Premix Blowers for Gas ¼ to 1 HP.
2—2 HP 20 oz. Spencer Turbine Blowers.
1—Spencer Turbine Blower, 2700 CFM, 27 oz., 30 HP, 3/60/220-440 V.

METAL MELTING EQUIPMENT
1—1000# open flame brass melting furnace, gas fired.
1—Hausfeld tilting crucible, gas fired, 500# brass.
1—Hausfeld Stationary Brass, oil or gas burner, 200# cap.
1—Hausfeld Tilting crucible, gas 250# Al. Cap.
1—Hausfeld 2000# aluminum capacity furnace barrel type, open flame, oil fired.
1—#2 U.S. rotary melting furnace, 500# brass.

MISCELLANEOUS
2—Hydro-Blast barrels with 25 HP pumps.
3—Jib cranes, 16′ swinging beam, 2000# cap.
1—International SB-11 core blower.
2—Pangborn cloth screen collectors, 1½ HP.
1—Stoney crane type shakeout.
1—Combs Riddle.
1—NDP Royer sand separator.
1—#16 Roto-clone unit complete.

Complete stock of rebuilt mill and dust exhaust blowers.

CLIFTON MACHINERY COMPANY
1023 W. SIXTH ST. CINCINNATI 3, OHIO

FOR SALE

Pangborn E.S. 347 Conveyor Cabinet, 4 throwing wheels, used for blasting motor blocks, a beauty, can be seen in operation. $9000 FOB Det.

DIAMOND SALES, INC.
5654 W. JEFFERSON DETROIT 9, MICH.
VI 36750

FOR SALE

1—Bartlett & Snow Style M 36" x 20 ft. rotary drier, complete with 5 HP, 220/440 V. motor. Drive-like new. Address: STANHOPE, 60 East 42nd STREET., NEW YORK 17, NEW YORK.

FURNACES FOR SALE

Ten used heat treating furnaces and two 7-ton gantry cranes. Good condition, priced to sell. Address: BAER STEEL PRODUCTS, INC., BOX 1428, BOISE, IDAHO.

FOR SALE

Slightly used Allis-Chalmers 5 KW Foundromatic Dielectric core drier. Address: EMPIRE PATTERN & FOUNDRY CO., BOX 1647, TULSA, OKLAHOMA, B. R. KINCADE.

For Sale

FOR SALE

1 Nichols plain Molding Machine
2 U. S. variable speed Grinders
2 Standard variable speed Grinders
2 Whiting Hydro-blast Cleaners
1 Skip Hoist Loader for American Tumblast
1 Johnston & Jennings #1020 Jolt Rollover
1 Davenport #28 SA Jolt Rollover Pattern Draw, 27 x 40 Table with Air Clamps
1 International Rollover-Portable
1 International Core Blower SB-13
3 Milwaukee Squeezers, Stationary
2 International Squeezers, Portable
3 Osborn Squeezers 275-J Portable
1 Whiting Tumbling Barrel 36 x 72 motorized
1 Tabor Shockless Jar, flask lift 32 x 32
3 Snag Grinders A.C. & D.C.
1 Cupola Blower, Buffalo #8
3 Pouring Ladles 2000 lb. Cap. geared
300 Aluminum Core Plates 16x22—16x20—18x24
Steel Flasks 13 x 22 up to 26 x 31
I-R Air Hoists never used, in original crates 1 and 2 ton
1 Wilson Hardness Tester
35 Steel corrugated, collapsible, stacking type boxes, 34 x 50 x 25 deep
Magnesium Buckets for elevators, never used.
Belting from 12" to 24" Never used
Air hammers, Grinders and Rammers.

Many other items in stock
Send us your inquiries
WE BUY — SELL — TRADE
HOMAN MACHINERY COMPANY
824 REEDY ST.,
CINCINNATI 2, OHIO
MAin 1-4634

FOR SALE

1—AJAX-TAMA WYATT INDUCTION FURNACE, never used stationary type BS1, c/w controls and installation tooling for melting and holding aluminum alloys. Rated 35 KW, 460V, 60 cycles. Price $4,500.

OREGON METALLURGICAL CORP.
P.O. BOX 311
ALBANY, OREGON
WABASH 6-2273

For Sale

FOR SALE

ALLIS-CHALMERS SAND CORE DRIER

Allis-Chalmers Model 100-A Foundromatic sand core drier consisting of 2 Model 100-25 KW dielectric generator units, and 2 conveyorized oven assemblies with single infeed and outfeed sections.

This equipment was used for experimental purposes and is practically new.

LINDE AIR PRODUCTS COMPANY
646 FRELINGHUYSEN AVENUE
NEWARK 5, NEW JERSEY
ATTN: J. M. HALBING

FOR SALE

San-Blo Core Blower—Model 40-P-8
For 440 volt, 3 phase, 60 cycle
Capacity 40 lb. core—Excellent condition.

W. R. SPRAGUE
AMERICAN HOIST & DERRICK CO.
63 SOUTH ROBERT STREET
ST. PAUL 1, MINNESOTA

FOR SALE

1—Simpson Mixer, #2, 20 HP motor.
Miscellaneous: Screens, Pulverizers, Grinders. Tyler Rotap Screens etc.
Wanted: Your Idle Machinery.

OUR 39th YEAR
CONSOLIDATED PRODUCTS CO., INC.
66 BLOOMFIELD STREET
HOBOKEN, NEW JERSEY
HO 3-4425 N. Y. TEL. BA. 7-0600

For Sale

FOR SALE

TURBO BLOWERS WITH MOTORS

CFM	PRESS.	MAKE	CFM	PRESS.	MAKE
12300	24oz.	Spencer			
8375	20oz.	Spencer	380	16oz.	No.Am.
6000	32oz.	Ing.-Rand	340	20oz.	A-B
4700	32oz.	Ing.-Rand	320	12oz.	Spencer
2500	7oz.	Sturt.	9000	6"SP	Northern
1300	16oz.	Spencer	3420	8"SP	N.Y.
800	13oz.	Buffalo	2700	⅝"SP	Ilg
400	12oz.	Buffalo	2500	½"SP	American
450	7oz.	Spencer	1100	4½"SP	Bayley
400	16oz.	No.Am.	2344	2"SP	Clarage

THE MOTOR REPAIR & MFG. CO.
1532 HAMILTON AVE.
CLEVELAND 14, OHIO

FOR SALE

Four Osborn Model 2047-3 Rollover jolt molding machines, serial #10867-BN. Core box 21¼ x 22¼, flask space 11⅛", pattern draw 8". Never used.

TRIPLEX MACHINE TOOL CORP.
75 WEST STREET
NEW YORK 6, NEW YORK

FOR SALE

Lectromelt 250 lb. type "U" side charge electric furnace. Complete, good condition.

BEAVER VALLEY ALLOY FOUNDRY CO.
MONACA, PENNSYLVANIA

CLASSIFIED ADVERTISING RATES

(Effective July 1, 1956)

POSITION WANTED—Minimum advertisement set solid, 30 words or less, $3.50. Additional words 15c each.

ALL OTHERS — "Help Wanted"—"For Sale"—"Wanted-To-Buy", etc., minimum advertisement set solid, 30 words or less, $8.00. Additional words 30c each.

NOTE—If replies are to be sent to a box number in care of FOUNDRY, add 8 words to your advertisement for box number and address.

Any advertisement set in all capital letters, add 50% to the above rates.

INCH RATES PER INSERTION

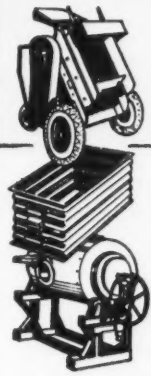
Single Column 2¼" Wide	One Time	Three Times	Six Times	Nine Times	Twelve Times
1 inch	$ 22.20	$ 21.00	$ 19.80	$ 19.20	$ 18.60
2 inches	43.20	40.80	38.40	37.20	36.00
3 inches	63.00	59.40	55.80	54.00	52.20
4 inches	81.60	76.80	72.00	69.60	67.20
5 inches	99.00	93.00	87.00	84.00	81.00
6 inches	115.20	108.00	100.80	97.20	93.60
7 inches	130.20	121.80	113.40	109.20	105.00
8 inches	144.00	134.40	124.80	120.00	115.20
9 inches	156.60	145.80	135.00	129.60	124.20
10 inches (1 col.)	168.00	156.00	144.00	138.00	132.00
15 inches (½ page)	243.00	225.00	207.00	198.00	189.00
20 inches (2 cols.)	312.00	288.00	264.00	252.00	240.00
30 inches (full page)..	450.00	414.00	378.00	360.00	342.00

Remittance should accompany advertisement when submitted —Cash Discount 2%, 10 days.

Classified Forms Close the 13th of Month Preceding Issue

FOUNDRY

PENTON BUILDING • CLEVELAND 13, OHIO



EUCLID FOUNDRY & MACHINE EQUIPMENT CO.

14919 SARANAC ROAD — CLEVELAND 10, OHIO

ANNEALING FURNACE
Loftus Engineering, Pusher type, gas fired, recirculating complete with all controls overall dimensions: 45′ lg. x 10′ wide x 12′ high

MOLDING MACHINES
Jolt Squeeze Strip
- 2—#724 Osborn Pinlift, 24″ squeeze cyl., 10″ draw
- 2—#24-54D Nicholls Framelift 24″ squeeze cyl., 8″ draw

CORE OVENS
- 1—Steiner Ives Co., gas fired, recirculating, Wheelco Controls, 88″ wide x 48″ deep, 7′ high, 4 horizontal counterweight doors
- 1—Despatch, gas fired, recirculating, auto-control
- 1—Porbeck, gas fired, recirculating, drawer type, auto-control
- 1—Coleman, Jr., gas fired, recirculating, drawer type

TUMBLING MILLS:
- 1—60″ x 72″ Ransohoff tumbling type wet cleaning mill, Serial No. 6318, drive 15 HP, bucket loader 5 HP 3/60/220
- 1—30″ x 54″ Whiting
- 1—36″ x 54″ Whiting

MAGNESIUM CLEANING CABINETS:
- 6—Whirlpool Duplex, 800 CFM, 100″ wide x 65″ deep x 90″ high. Buffalo exhausters—7½ HP., 220/440

FOR SALE NOW . . .
In Bellville, Ohio, 10 miles south of Mansfield a complete gray iron foundry with No. 7 Whiting cupola, 18,000 sq. ft. with railroad siding.

WE BUY AND SELL ONE PIECE OF EQUIPMENT OR COMPLETE FOUNDRIES

GUARANTEED USED FOUNDRY EQUIPMENT . . . GLENVILLE 1-1222

Circle 865 on Inquiry Card—Page 203

ACME IS NOW LIQUIDATING

SPENCER FOUNDRY DIVISION

PARK and FIRST STREETS

WILLIAMSPORT, PENNSYLVANIA

Phones 9161-9162 Williamsport

ONE OF THE EAST'S LARGER PRODUCTION FOUNDRIES.

OVER 200,000 SQUARE FEET FILLED WITH GOOD FOUNDRY EQUIPMENT

Everything must be sold! The building must be prepared for other uses as quickly as possible!

The following is a partial list of the thousands of items offered for sale—Send for our more complete list or better yet come over and see for yourself!

1—Whiting #10 Cupola; 2—Whiting #9 Cupolas; 2—14000 C.F.M. 40 oz. Cupola Blowers; 3—Simpson #3 Mullers; 1—B. & P. #70 Muller; 1—B. & P. #60 Muller; 3—Mold Conveyors, 1 with 48″ x 84″ cars; 3—Synchronous Air Compressors up to 300 H. P.; 30—Molders hopper system; 28—Molding Machines, Nichols, Milwaukee, Osborn, Davenport; 1—B. & P. 27/40 H.P. Slinger; 1—B. & P. 19″ Tractor Type Slinger; 2—Slinger Turntables 24′; 4—Shakeouts; 20—Air Hoists; 5—Core Grinders; 2—Fox Single Wheel Grinders; 10—Core Blowers; 4—Wheelabrators; 3—Tumbling Barrels; Laboratory Equipment; Complete Pattern Shop.

Ladles, 200 ton flasks, air tools, yard switching engine, monorails, trolleys, bridge cranes, core plates, chaplets, foundry supplies and alloys, thousands of feet of flat and troughing sand belt conveyors, thousands of feet roller conveyors, and other items too numerous to mention.

Please write for our illustrated circular.

WRITE • WIRE • PHONE

ACME EQUIPMENT COMPANY, INC.

DIRECT ALL INQUIRIES TO LIQUIDATION OFFICE

Park & First Streets, Williamsport, Pennsylvania; Phone: 9161-9162 Williamsport

Main Office: 126 S. Clinton Street, Chicago 6, Illinois; Phone: ANdover 3-3430

Circle 866 on Inquiry Card—Page 203

AAA MACHINERY & EQUIPMENT CO.

over 1000 satisfied customers

WORLD'S LARGEST INVENTORY OF GUARANTEED FOUNDRY EQUIPMENT

AIR COMPRESSORS

1—CHICAGO PNEUMATIC 8 x 7 Single Stage Horizontal, 160 CFM, 30 HP.
1—SULLIVAN WG-8 Size 7 x 7, 152 CFM, 20 HP, Horizontal.
1—SULLIVAN Model WG-9 Vertical, Size 8 x 7, 40 HP, 232 CFM, after cooler.
1—CHICAGO-PNEUMATIC Size 7½ x 6 Single Stage Horizontal 20 HP Motor.
2—GARDNER-DENVER Model ADR 4" Stroke, 15 HP Motor.
1—SULLIVAN WN-3 Size 20 x 12 x 14", 1220 CFM, 250 HP AC Motor.
1—GARDNER DENVER RXC, Size 9 x 9, Horizontal, 177 CFM, 40 HP w/Tank.

AIR HOISTS

10—INGERSOLL-RAND Size, C 2000 lb.
75—INGERSOLL RAND RC-5, 500 lb.
3—INGERSOLL RAND Size A, 500 lb.
6—INGERSOLL RAND Size B, 1000 lb.
15—DETROIT 1 and 2-ton cap.
15—APPLETON Air Hose Reels, swivel base, 50' and 75' capacities.
1—INGERSOLL RAND D-6, 3 Ton cap.

ELECTRIC HOISTS

1—DETROIT LHR, 5-ton capacity
1—P&H 5-ton capacity, Model LHR
1—COMET 1000 lb. capacity.
1—SHAW BOX 1000 lb. capacity.

BUCKET ELEVATORS

1—LINK BELT 50' centers, 7" x 5" Buckets, 8" wide Belt.
1—LINK BELT 37' centers, 16" x 8" buckets, 20" wide belt, with Motor & Drive.
2—NATIONAL 45' centers, 10" x 7" Buckets 12" wide Belt, w/Motor & Drive.
1—LINK BELT 35' centers, 12" x 7" Buckets, with Motor & Drive.
2—LINK BELT 60' centers, 16" x 8" Buckets, with Motor & Drive.

CUT-OFF MACHINES

1—DeWALT Model ME2 Cut-off Saw, 10 HP Motor, 24" Carboloy Blades.
1—GROB Band Saw, Type OS-36, open end, 36" throat. MD.
3—TESSEMER "I" Sprue Cutters.

CORE WIRE STRAIGHTENERS

1—CLIMAX #3, ¼" to ⅜", 10" length.
2—KANE & ROACH Model DX-5.

CORE GRINDERS

2—MILWAUKEE 70-12 Rotary type, 70" dia. table. Very Late.
1—STONEY Core Grinder, 16" dia. Wheel, 48" travel, 5 HP AC Motor.

CORE BLOWERS

1—CHAMPION CB-18, max. core 125 lb.
2—CHAMPION CB-10, max. core 10 lb.
2—CHAMPION CB-400, max. core 300 lb.
1—DEMMLER No. 1, max. core 10 lb.
2—DEMMLER No. 2K, max. core 20 lb.
2—DEMMLER No. 2E, max. core 20 lb.
2—DEMMLER No. 2, max. core 20 lb.
2—DEMMLER No. 3, max. core 35 lb.
2—DEMMLER No. 3K, max. core 35 lb.
2—DEMMLER No. 3E, max. core 35 lb.
1—DEMMLER No. 4, max. core 100 lb.
1—DEMMLER No. 4E, max. core 100 lb.
2—INTERNATIONAL SB-11, max. core 15 lb.
2—INTERNATIONAL SB-13, max. core 30 lb.
2—OSBORN No. 192, max. core 50 lb.
2—OSBORN No. 193, max. core 75 lb.
6—MILWAUKEE-TACCONE A-3, max. core 4 lb.
1—DEMMLER No. 50.
2—REDFORD No. 1 Bench type.
1—INTERNATIONAL SB-15H, with power core rollover.

CORE KNOCKOUT SYSTEM

Consisting of: SIMPLICITY 3' x 8' Shakeout, 24" x 60' Belt beneath Shakeout, Inclined Belt 24" x 105' with 18" x 24" Dings Magnetic Pulley & MG Set, JEFFREY 24" x 20" Double Roll Crusher, and 25-ton cap. Storage Bin.

CORE OVENS

4—CARL MAYER 2-Compartment Batch type, gas fired, recirculating, I.D. 7' W x 14' deep x 8' H, swing out doors.
1—INDUCTION Heating Dielectric, Model M-800A, 600 lb. per hr.
1—INDUSTRIAL "Revolving Carriers" continuous, 18" x 80" trays, gas fired.
1—MAEHLER Single Compartment, I.D. 96" L x 80" W x 84" H, gas fired, recirculating, L&N Controls.
2—DIETERT #500 Lab Drying type.

CUPOLAS, BLOWERS & ACCESSORIES

1—SPENCER—Turbo 150 HP Centrifugal, 7500 CFM, 48 oz. Like New.
1—ROOTS CONNERSVILLE Size 20 x 44, 7000 CFM, Type HD, 50 HP Motor.
4—LINDBERG Centrifugal Blowers, 2100 CFM, with 15 HP Motors.
5—WHITING 42" dia. Charging Buckets.
1—INGERSOLL RAND Single Stage FS-367, 100 HP, 9400 CFM.
2—INGERSOLL RAND FS-365 Turbo-Blowers, 50 HP Motor, 8150 CFM.

B & P SAND SLINGER SYSTEM

1—B&P Double Belt Stationary Sand Slinger, 19" Head, 4" Tip, 4' Ramming Unit, 6' Arm, 20 HP.
1—B&P 2 Ton Plate Feeder.
1—B&P 14' Dia. Rotary Turntable, Indexing Type.
6—B&P Champion Model LLA Power Pushoff Flask Lift Machines.
1—25' Bucket Elevator Loading Plate Feeder.

DUST COLLECTORS & ROTO-CLONES

1—AMERICAN AIR FILTER #20 Type N Rotoclone, Arrangement C, w/Sludge Ejector.
1—AMERICAN AIR FILTER #14 Type W, Arrangement C, with Sludge Ejector.
1—AMERICAN AIR FILTER #27 Type W, Arrangement C, with Sludge Ejector.
2—AMERICAN AIR FILTER #10 Type N, with Bench, for grinding.
1—AMERICAN AIR FILTER #24 Type N, 24000 CFM, 75 HP Motor.
3—AMERICAN AIR FILTER #30 Type W, Arrangement C, with Sludge Ejector.

ELECTRIC ARC MELTING

2—AJAX #500 Nose Tilt Furnaces, 3000 cycle—used with Induction MG Set.
1—AJAX #300 Nose Tilt Furnace, 3000 cycle—used with Induction MG Set.
2—DETROIT Rockers, indirect arc, Type AA 750-1000 lb. cap., w/200 KVA Transformers.
2—DETROIT Rockers, indirect arc, Type AA 1000-1500 lb. capacity, with 358 KVA Transformers.
1—AJAX 20 KW Melting Unit Complete w/Furnace & Controls.

GAS & OIL FIRED FURNACES

2—LINDBERG FISHER MNP Size 300, electric tilt, with motor and blower.
6—LINDBERG FISHER MNP Size 1700, electric tilt, with motor and blower.
3—LINDBERG FISHER MNP Size 2400, electric tilt, with motor and blower.
2—LINDBERG FISHER Type BBI Size 225, hand tilt, with motor & blower.
12—LINDBERG FISHER Type SSH Size 550 stationary, with Motor & Blower.
6—LINDBERG FISHER Type SSH Size 150 stationary, with Motor & Blower.
2—CAMPBELL HAUSFELD IPNT Size 2000, electric tilt, w/Motor & Blower.
10—CAMPBELL HAUSFELD Stationary, Size 100-200, with Motor & Blower.
1—LINDBERG FISHER Type BBI Size 1000, hand tilt, gas fired.

GRINDERS—SWING FRAME

1—MARSCHKE 12" x 2" wheel, 3 HP
1—MARSCHKE 20" x 10" wheel, 10 HP.
2—FOX No. 6, 24" x 10", 15 HP.
3—MARSCHKE 24" x 3" wheel, 15 HP.

GRINDERS—SNAGGING

2—U.S. ELECTRICAL #64, 20" x 3" wheel, 7½ HP motor, 4-speed.
1—HAMMOND WR-1, 24" x 3" wheel, 10 HP.
2—SAFETY RITE #174, 24" x 3" wheel, 10 HP.
2—MARSCHKE Model LGZAH, 24" x 4" wheel, double end, 20 HP, 4 speeds.

GRINDERS—DISC

1—BEASLEY #372 Vertical Spindle Dry Grinder, 53" dia., 20 HP. New 1952.
1—QUEEN CITY Model 100 Double End, 20" x 2" wheel, 10 HP Motor.
1—U.S. ELECTRICAL #80 Double End, 16" x 3" wheel, with 7½ HP Motor.

HEAT TREAT FURNACES

1—TOCCO JR. 20 KW Induction Heating Unit single station, 9600 cycles, with 40 HP Motor.
2—LINDBERG Model 4860-GH, gas fired, 48" x 60", recirculating, 1250° F.
1—LOFTUS Annealing Walking Beam type, gas fired, recirculating, 1600° F., 10' x 12' x 40'.

LADLES

5—WHITING Cylindrical, 3000#, geared.
12—MODERN F-9 and FA-9 Pouring Devices, with 400 to 800 lb. ladles.
3—WHITING Cylindrical, 19" x 26", 275 lb. cap.
2—MODERN Cylindrical, 29 x 30, 1500 lb.
1—MODERN Mixing, 44" x 44", on wheels, 4000 lb. cap.
2—STEVENS Cylindrical, 29" x 41", 2450 lb. cap.
9—WHITING Lip Pour, 23" x 23", 1200 lb.
6—MODERN Lip Pour, 24" x 24", 1600 lb.
2—WHITING Lip Pour, 29" x 29", 2000 lb.
2—WHITING Lip Pour, 41" x 41", 7000 lb.
1—WHITING Lip Pour, 44" x 44", 8000 lb.
1—WHITING Lip Pour, 58" x 58", 10-ton.
1—WHITING Lip Pour, 40-ton capacity.
7—WHITING Bottom Pour, 48" x 48", 4-ton.
1—WHITING Lip Pour, 20-ton capacity.
1—MODERN Cylindrical Mixing, 3-ton cap. electric.

MOLDING MACHINES

JOLT SQUEEZERS

2—MILWAUKEE #104, 10" cyl., portable.
2—MILWAUKEE #123, 12" cyl., stat.
6—MILWAUKEE #181, 18" cyl., 24" x 36" table.
8—OSBORN #275-JW, 10" cyl., portable.
16—OSBORN #275-J, 10" cyl., portable.
3—OSBORN #276-J, 12" cyl., portable.
6—OSBORN #210-PJ, 10" cyl., stat.
6—OSBORN #212-PJ, 12" cyl., stat.
20—SPO #110-J, 10" cyl., portable.
6—TABOR 10" cyl., portable & stat.

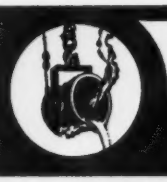
JOLT ROLLOVER PATTERN DRAW

1—JOHNSTON & JENNINGS #612-B, 24" x 30" table, 12" draw, 1000 lb. jolt cap.
1—DAVENPORT 28-SA, 29" x 40" table, 12" draw, 1500 lb. jolt cap.
2—DAVENPORT 40-SA, 42" x 50" table, 18" draw, 3000 lb. jolt cap.
1—HERMAN 6000 lb. Series, 42" x 78" table, 20" draw.
3—HERMAN Hi-Speed Jar, 1500 lb. series, 26" x 48" and 26" x 30" tables.
1—HERMAN 750 lb. Series, 20" x 30" table.
2—HERMAN 4000 lb. Series, 40" x 60" table, 13" jolt cyl.
6—INTERNATIONAL "R" Core Rollovers.
2—INTERNATIONAL "G" Size 20" x 8".
3—INTERNATIONAL "G" Size 24" x 10".
2—INTERNATIONAL "G" Size 30" x 12".
1—INTERNATIONAL RES Size 15" x 8".

WRITE FOR OUR COMPLETELY NEW CATALOG OF USED FOUNDRY EQUIPMENT.

AAA MACHINERY & EQUIPMENT CO.

15539 SARANAC ROAD — CLEVELAND 10, OHIO — CALL LI. 1-6545



AAA MACHINERY & EQUIPMENT CO.

over 1000 satisfied customers

WORLD'S LARGEST INVENTORY OF GUARANTEED FOUNDRY EQUIPMENT

4—JOHNSTON & JENNINGS #918, 44" x 54" table, 20" draw, 2000 lb. cap.
1—JOHNSTON & JENNINGS #815-B, 30" x 40" table, 15" draw, 1500 lb. jolt cap.
1—MILWAUKEE #167, 32" x 33" table, 12" draw. 1000 lb. jolt cap., 16" sq.
1—MILWAUKEE #217, 35" x 41" table, 16" sq. cyl., 12" draw, 1200 lb. jolt
1—MILWAUKEE #60B-3, 60" flask, 18" draw.
10—OSBORN #40 and 42 Hand Core Rollovers, 18" x 8" draw.
1—OSBORN #442, 21" x 31" table, 10" draw 600 lb. jolt cap.
1—OSBORN #242W, 29" x 42" table, 19" draw, 1500 lb. jolt cap.
2—OSBORN #405, 57" x 64" table, 26" draw 3000 lb. jolt cap.
6—OSBORN #601, 30" wide flask, 10" draw, 750 lb. jolt cap.
6—OSBORN #602, 36" wide Flask, 10" draw, 750 lb. jolt cap.
1—SPO #413D, 24" x 25" table, 10" draw, 600 lb. jolt cap., 13" sq. cyl.
1—SPO #506, portable, 24" x 30" table, 10" draw, 600 lb. jolt cap.
3—TABOR 30" x 40" table, 12" draw, 1000 lb. jolt cap., stationary.
4—TABOR 22" x 32" table, 10" draw, 600 lb. jolt cap.

JOLT PIN LIFT

1—OSBORN #560, 32" x 45" table, 12" draw, 2500 lb. jolt cap.
2—DAVENPORT 24-AJS, 24" x 30" table, 8" draw, 1000 lb. jolt cap.
2—MILWAUKEE #2542, 38" x 42" table, 12" draw, 3000 lb. jolt cap.
2—OSBORN #559, 25" x 30" table, 6" draw, 1200 lb. jolt cap.
1—OSBORN #563, 55" x 63" table, 12" draw, 7000 lb. jolt cap.
1—SPO #3058, 22" x 28" table, 8" draw, 750 lb. jolt cap.

PIN LIFT

1—B&P Model AL2424 Jolt Speed Draw.
1—INTERNATIONAL LP-6, 8" draw, 750 lb. jolt cap.
1—INTERNATIONAL LP-10, 30" x 30" flask, 1000# cap.
2—MILWAUKEE #620-ND, 24" x 30" table, 2000 lb. cap.

JOLT SQUEEZE PIN LIFT

1—MILWAUKEE #216, 21" cyl., with roll-on and roll-off attachments.
1—MILWAUKEE #125, 21" x 27" table, 8" draw, 12" squeeze cyl.
1—OSBORN #716-PJ Stat., 22" x 34" table, 7" draw, 16" squeeze cyl.
1—OSBORN #712-V, 18" x 26" table, 12" squeeze cyl.
4—INTERNATIONAL PKL, 12" squeeze cyl., 6" draw.
2—OSBORN #710-J, 17" x 21" table, 10" squeeze cyl.
1—SPO #2114, 20" x 27" table, 4" draw, 600 lb. jolt cap., 11" cyl.
2—SPO #2136-G, 19" x 26" table, 6" draw, 13" cyl., portable.

JOLT (BUMPERS)

1—HERMAN 40" x 60" table, 6000 lb. cap.
1—TABOR 30" x 40" table, 2800 lb. cap.
1—HERMAN 8' x 12' table, 10000 lb. cap.

MATERIAL HANDLING EQUIPMENT

1—HAYWARD 1 cu. yd. Electric Clamshell Bucket, w/Sheppard Electric Hoist.
1—EC&M 45" dia. Type SA Electric Magnet, 115 volts DC.
3—HOUGH Model HA Payloader, hydraulic lift, 12 cu. ft. cap. bucket.
1—BLAW-KNOX ½ yd. Bucket, single line.

STEEL APRON CONVEYOR

2—JEFFREY 48" x 12'
1—LINK BELT 48" x 200' Centers
1—NATIONAL ENG. 30" x 120' Centers.
1—NATIONAL ENG. 30" x 45' Centers.

CONVEYOR BELT—BUILT TO YOUR SPECIFICATIONS

20", 24" and 30" wide, either flat or trough idlers, Timken bearings, takeups, motors and speed reducers, any designated speed. All material used, with exception of steel. Can be supplied with hoppers and plows. Send us your Prints.

OSCILLATING CONVEYOR

2—LINK BELT 30" x 45' w/Drive & Motor.
1—LINK BELT 30" x 80' w/Drive & Motor.
1—LINK BELT 30" x 65' w/Drive & Motor.
3—SIMPLICITY Model OA-10-A, 36" x 15'.
1—LINK BELT 48" x 154'.

OVERHEAD HOPPERS & STORAGE BINS

1—JEFFREY 60-ton Storage Bin
1—LINK BELT 100-ton Storage Bin
1—NATIONAL ENG. 12' x 14' Steel Sand Storage Hopper, 100-ton cap., bolted.
50—LINK BELT 1½ Ton Hoppers.

ROLLER CONVEYOR

1500' MATHEWS 16", 24" & 30" wide Rollers, 2-9/16" dia., 3" & 4" center 11/16" hex shaft.
800' MATHEWS 22" Roller Conveyor, 2¼" dia on 6" centers, 4" channel iron.
200' MATHEWS 6" Roller Conveyor, 2½" dia. on 3" centers, 4" channel iron.

UNDERCAR UNLOADER

6—FARQUHAR 18" x 30', with 5 HP Motors.
1—FARQUHAR 14" x 20' with 3 HP Motor.

TRAMRAIL

6—LOUDEN MONORAIL Bridges, two 20' span, two 12' span, two 30' span, 1 and 2-ton capacity.
1—AMERICAN TRAMRAIL System, with one 1-ton 20' span Underslung Bridge and 150' of 12" tramrail, with air reels.
6—AMERICAN TRAMRAIL 2 and 4-ton 20' span Underslung Bridge Cranes, chain gear travel.

OVERHEAD CRANES

1—WHITING 5-ton Overhead Crane, 50' span, cab operated, AC current.

MOLD CONVEYOR

1—LINK BELT 36 cars 4' x 5', 190' Track, with automatic dump. New 1952.
3—LINK BELT 88 Cars 20" x 48", 350' track, with automatic dumping.

SAND MULLERS

1—B&P #3½ Mulbaro, 350# batch.
1—B&P #7 Mulbaro, 700 lb. batch.
1—JEFFREY Type 1 Hammer Mill, Size 15 x 8.
1—BEARDSLEY & PIPER #30 Speedmullor, 3 cu. ft. batch, w/20 HP Motor.
1—SIMPSON #0 Sand Muller, 3' pan dia., 175 lb. batch.
1—LINK BELT 48" x 8' Paddle Type.
1—BAKER PERKINS #16½, 30 HP Motor.
2—SIMPSON #1 Style B, 400 lb. Batch cap.
3—SIMPSON #3 Style C, 3000 lb. batch.
1—SIMPSON #2 Style C, 1500 lb. batch, enclosed gear, with Loader.
3—SIMPSON #3 Style UD, 3000 lb. batch, w/Cooling Hood & Exhauster.
1—DRAVO-DOYLE 6 cu. ft. cap. Wonder Model, portable, 5 HP 220/440 Motor.
1—CLEARFIELD No. 414, 4 cu. ft. Batch, 5 HP.
1—CLEARFIELD No. 610, Batch 1000#'s w/Skip Hoist Loader.

SAND PREPARATORS

2—NATIONAL #3 Style C Aerators, 60-ton per hr. cap.
6—ROYER Sand Conditioning Units, consisting of:
1—1' x 5' Royer Shakeout.
1—Farquhar 18" x 30' Conveyor.
1—Royer NDS Sand Preparator.
6—B&P Screeenerators, Models S, M & L.
1—PEKAY Aerator, Model 320-3.
8—ROYERS, Models NDP, C-2, NC-4, NDS.

SAND CUTTERS

1—AMERICAN Model AA, 5'2" Blade.
2—AMERICAN Model M, Size 79/60.
1—AMERICAN Model M, Size 99/80.
1—AMERICAN Model M, Size 89/70.
1—AMERICAN SandMaster, 72"/102".

SANDSLINGERS

2—JEFFREY Swivel type Flask Filler Booms.
1—B&P Tractor type, 19" head, 13' arm.
1—B&P 16" Tractor type, 13' arm, magnetic tower, 4' ramming, 4" tip.
2—B&P Model 16S-DB Stationary type, 16" head.
2—B&P Swing type Slingers, 19" head.
1—B&P Stationary, double Belt, 4' impellor, 22" head, 5" tip, 50 HP.
2—B&P Model DB, stationary, 19" head, 4' impellor, 4" tip, 25 HP Motor.
3—Plate Feeders—7' dia. x 18' deep, 10 HP Motor & Reducer.

SHAKEOUTS & SCREENS

1—SIMPLICITY 3' x 5' Model B, 5000# cap.
1—ROYER 30" x 5' Model ST, 5000# cap.
22—NATIONAL ENG. 1½-ton Moulders Hoppers air operated gates.
1—NATIONAL ENG. 5' x 8' Hexagon Revolving Tapered Screen, with Motor & Drive.
1—SIMPLICITY 3' x 8' Model BG, 5000#.
1—ROBBINS 8' x 10' Model JF-11 Dual, 16 ton per unit, w/two 20 HP Motors.
1—SIMPLICITY 4' x 10', Model D, 16000#.
1—HEWITT-ROBINS 36" x 78" Vibrex.
3—LINK BELT 5' x 10', heavy duty.
1—SIMPLICITY 6' x 8", Model DE, 16000#.
1—SIMPLICITY 4' x 10' Model B, single deck sifter screens, 10 HP Motors.
1—SIMPLICITY 5' x 8' Model D, 16000#.

TUMBLING BARRELS

2—SLY 42" x 72" Square, 10 HP Gearhead, w/built-in brake, Timken bearings.
2—SLY 36" x 84" Type C, 7½ HP Gearhead, w/built-in brake, Timken bearings.
4—WHITING 48" x 72", 10 HP Gearhead, w/built-in brake, Timken bearings.
1—SLY 48" x 96" w/Motor & Drive, mag. brake, Timken bearing.
1—SLY 72" x 120", w/Motor & ½ Drive, mag. brake, Timken bearing.
1—SLY 36" x 54" Type C Round, with 5 HP V-belt Drive.

SAND BLAST EQUIPMENT

1—AMERICAN WHEELABRATOR 48" dia. Swing Table. New 1952.
1—AMERICAN 56" dia. Swing Table, with dust collector.
1—AMERICAN #3 Tablast, w/four 48" dia. auxiliary tables.
1—AMERICAN #1 Tablast, w/seven 14" dia. auxiliary tables.
1—AMERICAN 27" x 36" Tumblast, w/Skip Hoist, shot return and electrical.
1—AMERICAN 36" x 42" Tumblast, w/Skip Hoist, shot return and electrical.
1—AMERICAN 48" x 42" Tumblast, w/Skip Hoist, shot return and electrical.
1—HOLLINGSWORTH Model 44" x 48".
1—HYDRO-BLAST Cabinet, 40 HP Motor & Pump.
1—PANGBORN 9LF-14—9' dia. Plain Table w/two Roto-Blast units and CH-2 Dust Collector, 4850 CFM. New 1951.

TESTING EQUIPMENT

1—G.E. KX-10 X-Ray, 140 KW, industrial.

HINES Pop-off Flask—350 Assorted Sizes—all Copes and Drags, single and double pins. Send for Complete Listing!

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25—CENTRIFUGAL, 16 oz., 2 to 5 HP
10—GE, WILBRAHAM-GREEN, FISHER Positive Pressure and Cent. Cupola Blowers

CLEANING EQUIPMENT

1—AMERICAN WHEELABRATOR TUMBLAST 1945, 48" x 72", with Skip Loader, Vert. bucket conveyor, motors & controls

1—AMERICAN WHEELABRATOR TUMBLAST, 48" x 48" w/loader used 9 Mos.
1—AMERICAN WHEELABRATOR TUMBLAST, 42" x 48" w/loader
1—AMERICAN WHEELABRATOR TUMBLAST 36" x 42" w/loader
1—PANGBORN TABLAST, 8' Table
1—PANGBORN ROTOBLAST, #BVR-5
1—PANGBORN ROTOBLAST, #28, Type GK
1—PANGBORN BLAST CABINET, #EP-5
3—TANNEWITZ METAL CUTTING BANDSAWS, 30" and 36"
1—CRESCENT METAL CUTTING BANDSAW, 30"
4—BURRING BENCHES, Magnesium cleaning, 9' L x 30" H x 30" W

CONVEYORS

1—LINK BELT, vibrating, double deck, 80' x 24", w/exhaust hood
1—LINK BELT, Car type mold, 114 cars, 403' track, car size 18" x 42"
1—JEFFREY, 3 compartment, ingot mold
4—SAND ELEVATORS, Various sizes
6—SAND BELTS, 10' ctrs. to 140' ctrs.
2500 FEET—FOUNDRY TYPE ROLLER CONVEYOR—ALL SIZES

CORE BLOWERS

2—DEMMLER #2, vert. or horiz.
1—DEMMLER #2A
1—DEMMLER #3K
1—DEMMLER #55, Late Model
1—DEMMLER #2K
1—OSBORN #92
2—OSBORN #192, #193
1—CHAMPION CB-12
1—CHAMPION, Model CB-400
1—INTERNATIONAL SB-13
1—OSBORN Core Rollover, #136-3, (NEVER USED)

CUPOLAS

2—WHITING #5 complete with Skip Charger and Blower
1—MORRIS #9, Skip charger, Blower, Mixing Ladle, Never Installed
1—SKIP CHARGER for #9 Cupola with scale and buckets
1—WHITING #4 with skip charger, Motor and Blower

DUST COLLECTORS

4—ROTOCLONE, #12, Type N, wet type
1—ROTOCLONE #14D w/Filter
1—ROTOCLONE, 16W
2—ROTOCLONE, Size 20D, Hopper type F
1—ROTOCLONE, Type W, 30" w/precleaner

FLASKS

150 HINES AND FREEMAN ALUMINUM, Popoffs and Jackets
200 TRANSITE CORE PLATES, Various Sizes
SEND US YOUR REQUIREMENTS

FURNACES—DIRECT ARC MELTING

1—3,000#/hr. LECTROMELT 23,000 V
1—250 Lb. LECTROMELT, Side Charge
1—500 Lb. LECTROMELT, Side Charge
1—1½ Ton/hr. HEROULT, Late Type

FURNACES—INDIRECT ARC

1—350#/hr. DETROIT, Complete
1—1500# DETROIT ROCKER, Complete

FURNACES—INDUCTION MELTING

1—30 KW, LEPEL
1—20 KW, AJAX SPARK GAP, High Frequency
1—6 KW AJAX
1—3 KW, AJAX, Lab type
1—75KW Induction Melting Furnace complete with 200 lb. Furnace.
1—30 KW Induction Melting Furnace with 100 lb. Furnace.

MUST SELL AT ONCE

PANGBORN CONTINUOUS SHOT BLAST MACHINE

REPLACEMENT COST OVER $75,000.

5 Wheel Type each wheel driven by 20 Hp AC Motor. Pendulum type #458 chain conveyor for pick up and return, w/motor driven screw type conveyor for shot return to bucket elevator. Complete w/all controls and switches. Serial #180 RF-3918. Large lot of new spare parts.

PRICED FOR QUICK SALE

FURNACES—GAS & OIL

1—FISHER MNP, Gas, Tilting, 1700# cap. Mag.
2—FISHER, Gas, Stationary, 4 Burner, 500# cap.
1—FISHER MNP, Oil, Tilting, with blower, 500# cap. Alum.
1—FISHER MNP, Oil, with blower, 1500# cap. Brass
3—FISHER, Oil, Stationary, model 125, type S, Brass
1—DEMPSEY, Reverberatory, 10,000#, 9' W x 14' L x 9' H, Oil
1—HAUSFELD, Tilting, 1200# capacity
1—HAUSFELD, Gas, Stationary, 1000#
1—HAUSFELD, Gas, Stationary, 70-80# Alum.
1—CAMPBELL-HAUSFELD, Gas, 100-125 Crucible
1—SKLENAR, Oil, 600# Cap.
1—STROMAN, Gas, Tilting, 1,000# cap. Alum, auto control hyd. lift
1—REDA 550#. Never Used
1—CAMPBELL-HAUSFELD, Gas, 200-250# brass, Crucible with Gas Burner

MOLDING MACHINES

Jolt Rollovers

2—J & J #918
1—J & J #815, 30" x 40", 15" draw, 1200# jolt
2—INTERNATIONAL, 13 x 17" table, 6" draw
1—HERMAN 10,000#, 48" x 109" table
1—HERMAN 6000#, 42 x 78"
1—HERMAN 3000#, 30" x 66" Table
2—HERMAN 1500#
1—HERMAN 750#, 30" x 36"
1—OSBORN, 712 PJ, 18 x 28"
1—OSBORN #602, 36" x 26"
2—OSBORN #405-86, with leveling carriage
1—OSBORN #405, 3,000#, flask size 64" x 50", 18" draw
2—OSBORN #243, 28 x 40", 20" draw
4—OSBORN #142, 15" x 20", hand draw
4—TABOR, 40 x 60", 2000 & 3000# capacity
1—TABOR, 30" x 40" with air clamps
3—TABOR 22" x 42", pattern draw, shockless, portable
1—TABOR, 20 x 30" w/air clamps, 1000#
2—TABOR, 14" x 16" Rockover
1—SPO ROCKOVER #506

Bumpers

1—OSBORN #102
2—DAVENPORT, 30" x 30" table
1—DAVENPORT, 24" x 27" table

Jolt Strippers

1—J & J, 30" x 24" table, 600# cap.
2—SPO #305, 20" x 27" table, 750# cap.
1—HERMAN, 22" x 30" table, #4317
1—TABOR, 20" x 20" table, hand strip
1—MILWAUKEE #1536, 32" x 38"
1—INTERNATIONAL 1255 PKL
1—OSBORN #559
2—SPO, #2160
2—OSBORN, #712PJ, Stationary
1—TABOR, 17" x 20" table, portable

Jolt Squeeze Strippers

1—OSBORN #175, 21" x 18", portable
2—MILWAUKEE #163

Jolt Squeezers

2—MILWAUKEE #105JS, 17 x 21", portable
6—SPO #110J, Portable
3—OSBORN #276-J, Cantilever
7—OSBORN #275-J, Portable
6—OSBORN #275PJ, Stationary
2—INTERNATIONAL, #12 LJS
6—TABOR, 3" Jolt, 17 x 20"
4—INTERNATIONAL, #10 LJS
1—MILWAUKEE, #126, 21" x 27" portable
2—NICHOLS, #12 F-P, portable

MULLERS AND MIXERS

1—SIMPSON #0, 3' Dia., 1½ to 1¾ cu. ft.
1—CLEARFIELD, #920, 9' Dia., 25-30 cu. ft.
4—BAKER PERKINS, #4A

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2—ROSS, Gas, 2 compartment, recirc., rack type, 6½" x 14' x 7'
1—YOUNG BROS. elec., 3 compartment, Kiln type
3—GENRICH, elec., 3 drawer, preheating, auto-control, 9' H x 8' W x 6'7" L

SAND CONDITIONING

3—B & P SCREENERATORS Model L, M and S
1—ROYER PREPARATOR, Comb. Model RC, 40 Ton/hr. Scrap removal, 9' x 9' hopper
3—ROYER, NB-2, 12" Belt
1—JEFFREY SANDITIONER, PORTABLE

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THE ACME BARGAIN PAGE

BLOWERS
Ingersoll-Rand Type FS. Single Stage 4000 CFM @ 3.75 PSI, 100 HP, 220V G. E. Induction motor.
General Electric 7500 CFM, 20 oz., 89.6 Max. HP, 220V motor, Airway controls.
Ingersoll-Rand turbo compressor 10500 CFM @ 20 oz. 85 HP G. E. 220V 3500 CFM motor.
1—Whiting-Allis Chalmers Turbo. 5750 CFM 28 oz. 60 HP 440V air pressure.

CONVEYORS, VIBRATING
Os-A-Veyor 2-24″ x 24′ section with 6′ grizzley
36″ x 162′ Oscillating Pan Link Belt
30″ x 53′ Oscillating Pan Link Belt

CORE BLOWERS
3—International SB 12.
4—International SB 13.
10—Osborn 193.
1—Osborn 2035-2.
1—Champion CB 400.
2—CB 10 Late Type.

CORE GRINDERS
3—Milwaukee 70-9.

CORE OVEN VERTICAL HORIZONTAL
1—Coleman, combination oil or gas fired 43 carriers 24″ x 90″—1 hour 12 min. to 4 hours 48 min. cycle.
1—Coleman, combination oil or gas fired 43—2 shelf carriers 30″ x 144″ long. 2 hour 12 min. to 7 hour 24 min. cycle. Present replacement cost over $90,000.

CORE PASTE OVENS
2—Coleman Gas Fired 28′-25″ x 42″ opening.

DUST COLLECTORS
Rotoclone 24W, 30 HP.

ELECTRIC MELTING FURNACES
Detroit Electric 1500#—Kuhlman 13200 volt transformer complete with controls.
Detroit Electric 350#—Kuhlman 13200 volt transformer and controls.

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We have Electric Furnace Transformers in stock from 800 KVA to 2500 KVA. Write us your needs.

GRINDERS
Double End Disc:
1—U.S. 18″ wheels, 2 swing tables.

GRINDERS, SNAGGING
2—Hammond 10 WRI D. E. Snag. 20″ dia. wheels, 10 HP 220/440 v motors, variable speed drives.
1—3″ x 24″ U.S. #65, 20 HP 220/440V.

GRINDERS, SWING FRAME
1—3″ x 24″ x 12″ Marschke, 20 HP.
1—3″x24″x12″ U.S. 15 HP.

HOT METAL CARRIERS
3—1 ton D.C. Cab operated Cleveland, Monotractor Hot Metal Carriers.

MOLDING MACHINES
Jolt Squeezers:
5—Milwaukee 103-11 Staty. Jolt Squeezers, 13½″ x 20″ table.
7—Champion JS10P Portable Jolt Squeeze molding machine, 18″ x 21″ table.
4—Osborn 275J.
Jolt Squeeze Pin Lifts
2—Milwaukee Jolt Squeeze Strippers, Model 163-50, 15″ x 24″ table 16″ X open end pattern size.
1—#165 Milwaukee.
10—712 PJ Osborn

ROLLOVERS
1—Herman 4000# Series 30″ x 60″ table.
1—Herman 3000# Series 40″ x 84″ table, special slotted table.
1—Herman 1500# Series 20″ x 36″ table.
2—Herman 750# Series 20″ x 30″ table.
2—Herman 750# Series 20″ x 24″ table.
3—Spo Model 9032.
1—Milwaukee 217.
2—International Type G, Portable, 20″ x 8″ draw.
3—Tabor Portable Rollover 30″.
Johnston & Jennings 1020-44 x 44 max. Flask Size.

PIN LIFT PUSHOFFS
1—Champion Pin Pushoffs 28″ x 42″ table 10″ draw.

MULLERS
Simpson 1 H
Simpson #2 Unit drive
#70 B & P modern cross head, rebuilt.

OVENS, CORE
Despatch Type S, 2 cars 27½ x 54 x 64, Gas Fired.

OVERHEAD TROLLEY CONVEYORS
5000′ Jervis B. Webb & Link Belt 658 chain, 4 D.C. motor drive and MG set.

POURING DEVICES
3—Pouring devices, Whiting 500#.

SAND CONVEYORS
144′-30″ Flat with Drives.
47′-30″ Trough with Drives.
2—Simplicity Os-A-Veyor 24″ x 24′.

SHAKEOUTS
Link Belt 5′ x 10′—7½ HP motor

TUMBLING BARRELS
3—Royersford 42′ x 72′ Roller Bearing, Chain Drive.
1—Sly Square 42 x 42 x 64.
1—Sly 42″ Dia. x 56″.

WIRE STRAIGHTENERS
Climax 2A
Lewis 7C 1/16″ to 3/16″ with cutoff.

WHEELABRATORS
1—27″ x 36″ Rubber Belt Wheelabrator
48″ x 42″ American, bucket loader

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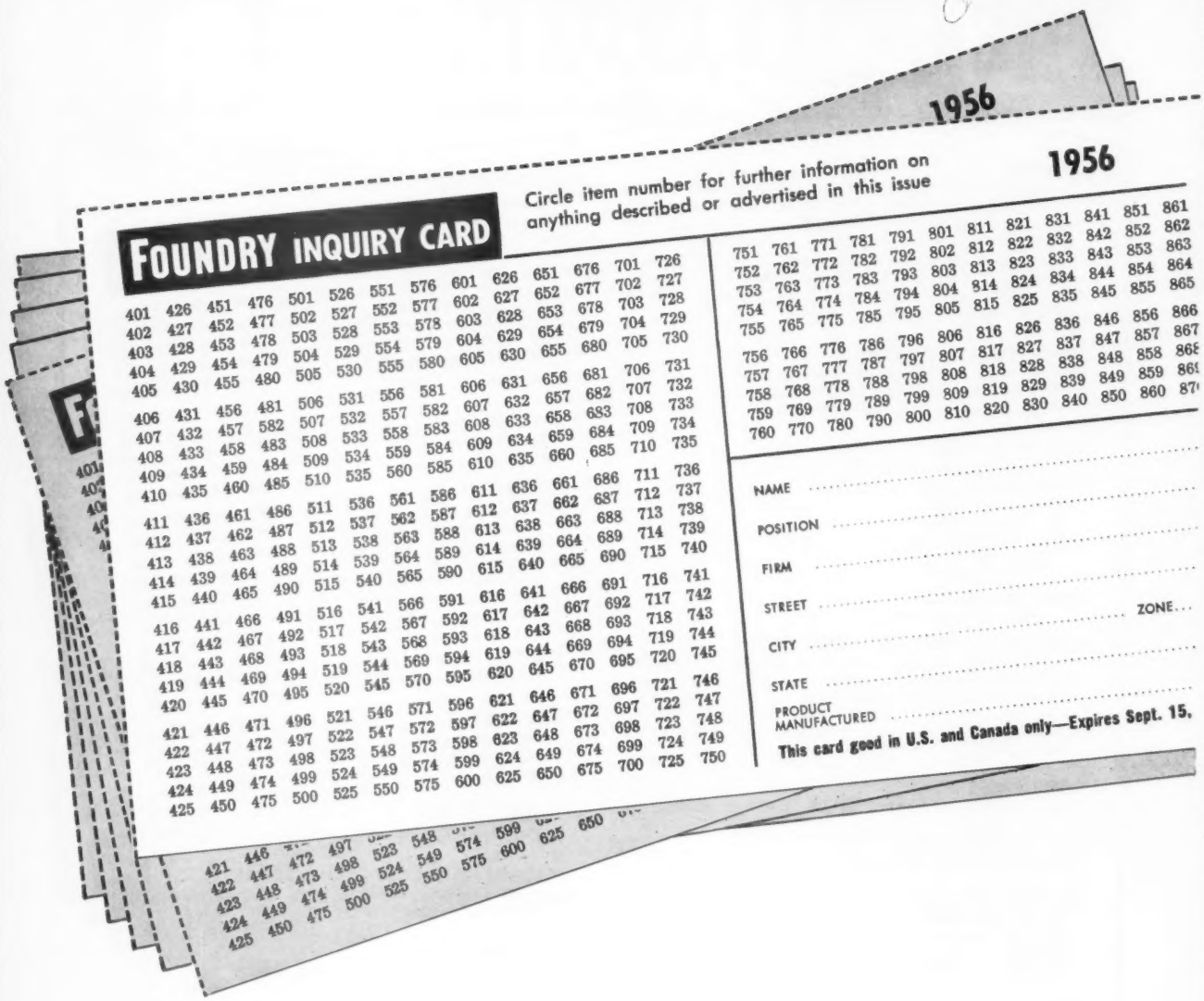

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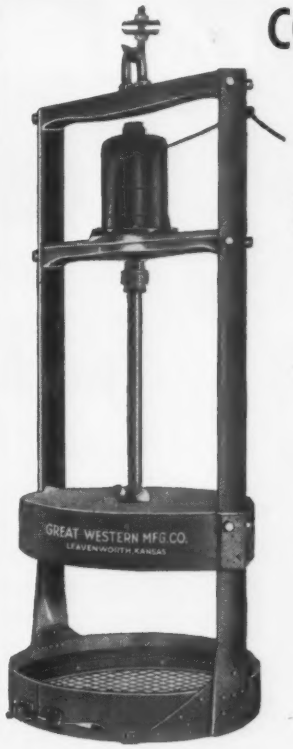
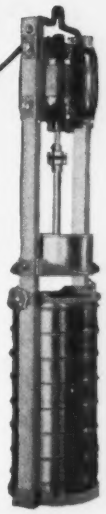
COMPARISON SOLVES RIDDLE SELECTION



TYPE "CR" 24″ dia. round sieve. Thoroughly sifts, mixes, fluffs, aerates the sand. ⅓ H.P. enclosed motor. Height 4′ 6″, weight 250 lbs. Complete: $350.00

TYPE "V" Screens sand Fine, Coarse, Medium. 20″ dia. sieve with special clamp for 5-second changes. Does work of 10 men. Fully-enclosed 1/6 h.p. motor 4′6″ high, weight 100 lbs. 20″ Sieve: $275.00. Giant V-5, 36″ Sieve: $495.00

TYPE "CS" 24″ square sieve. Continuous operation, no dumping. Refuse tails off to one side. Height 4′ 10″, weight 295 lbs. With ⅓ h.p. enclosed motor. Complete: $360.00



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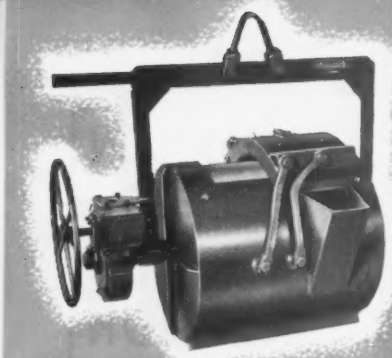
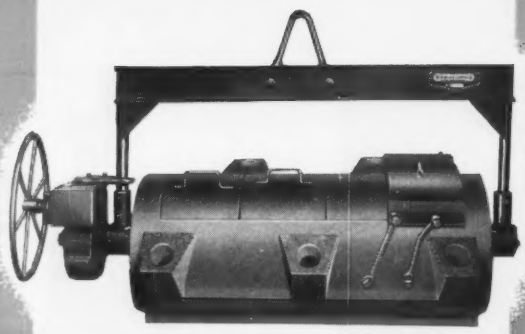
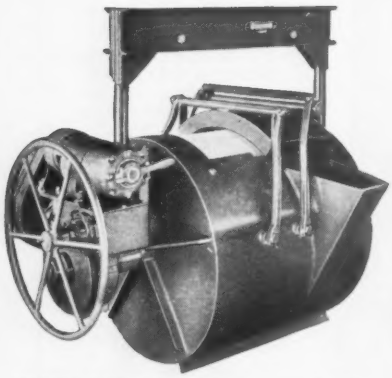


MODERN 800 lb. Geared, Covered and Insulated Cylindrical Ladle with square bail and crane-hook eye.



MODERN Special, 1500 lb. Covered and Insulated Geared Ladle with 5 Spouts.

MODERN 800 lb. Geared, Covered, Straight Sided Ladle with Square Bail and Crane-Hook Eye. Cover in open position.



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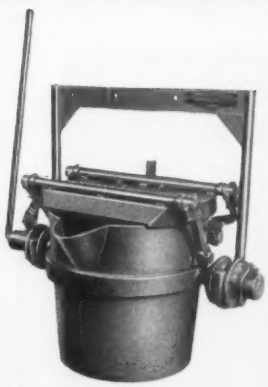
MODERN 1200 lb. Geared, Single Shell, Covered and Insulated Ladle with V-Bail.

MODERN 50,000 lb. capacity, 86" top diameter, geared, tapered bottom-pour ladle.



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